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# **CANADIAN** **MINING JOURNAL**

VOL. XXXV

TORONTO

No. 13

## Automatic Buckets

### HAYWARD CLAM SHELL BUCKETS

with ore bowls will  
handle your material  
to advantage.

Teeth simple to attach  
and easily renewed if  
necessary.



OPEN-HEARTH  
STEEL OR MAN-  
GANESE STEEL  
TEETH MAY  
BE FITTED AT A  
SLIGHT EXTRA  
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Clam Shell  
**BUCKETS**  
Orange Peel

100 Cu. in. to  
10 Cu. Yds

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We wish to draw the attention of mining, metallurgical, and development corporations to our excellent facilities for compiling, arranging, illustrating, printing and distributing Annual Statements, Special Reports, Descriptive Pamphlets, etc.

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High-grade Steel Castings of every description,  
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Ball Mill Wearing Parts  
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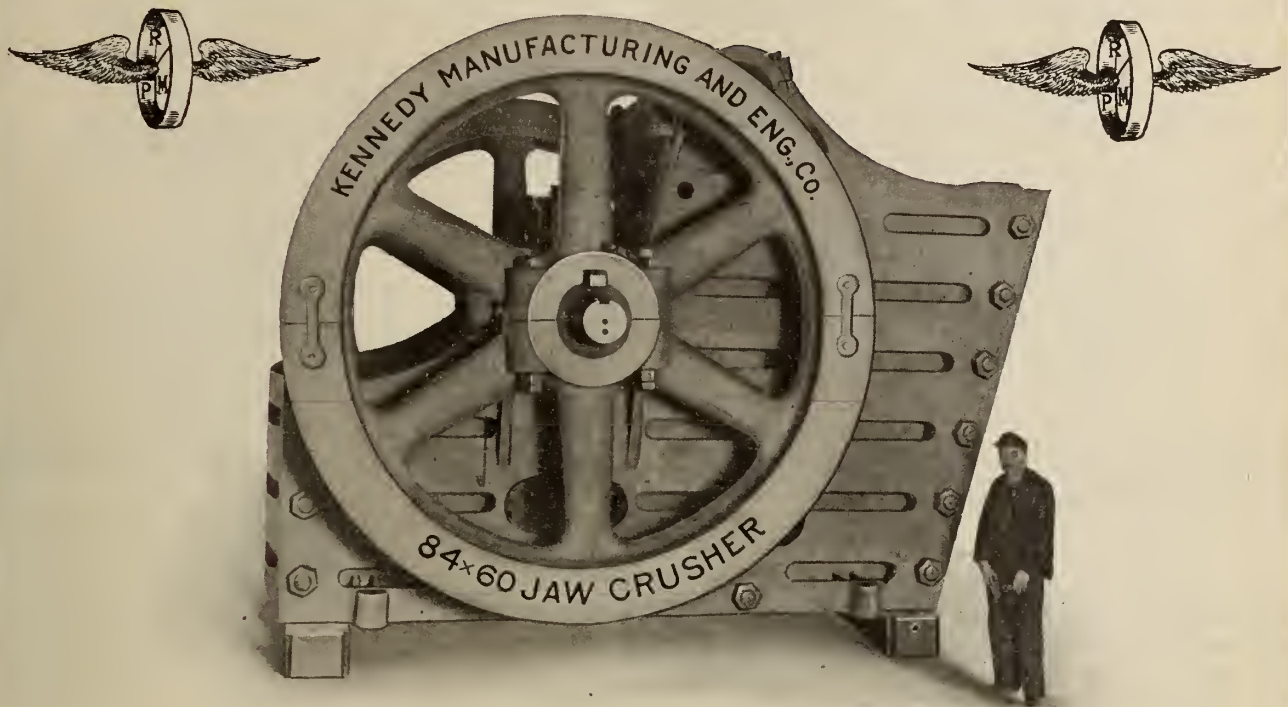
**THE ELECTRIC STEEL and METALS CO.**

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# Kennedy Mammoth Jaw Crusher

RUNNING MATE TO THE GREAT 42 GYRATORY

The above cut represents the Kennedy, balanced, steel frame, Jaw Crusher, made in sizes with openings from 7 x 10 to 96 x 60. By the substitution of steel frames for cast iron we make the machine 50% lighter and maintain 50% greater strength. With the balanced Jaw Crusher we cut down the power approximately 50%. Our Jaw plates are corrugated on both sides and the angle of the stationary and moveable Jaw is such that the Jaw plates are interchangeable from one Jaw holder to the other, reversible end for end and side for side, thus insuring at least 100% more wear out of the Jaw plates than can be procured from any other machine.

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made from special grades of Wire drawn to our specifications and carefully tested before being used. They are at work in all parts of Canada from Vancouver to Halifax and are everywhere recognised as the best on the market. Complete stocks held in all parts. Orders executed and quotations furnished by :-

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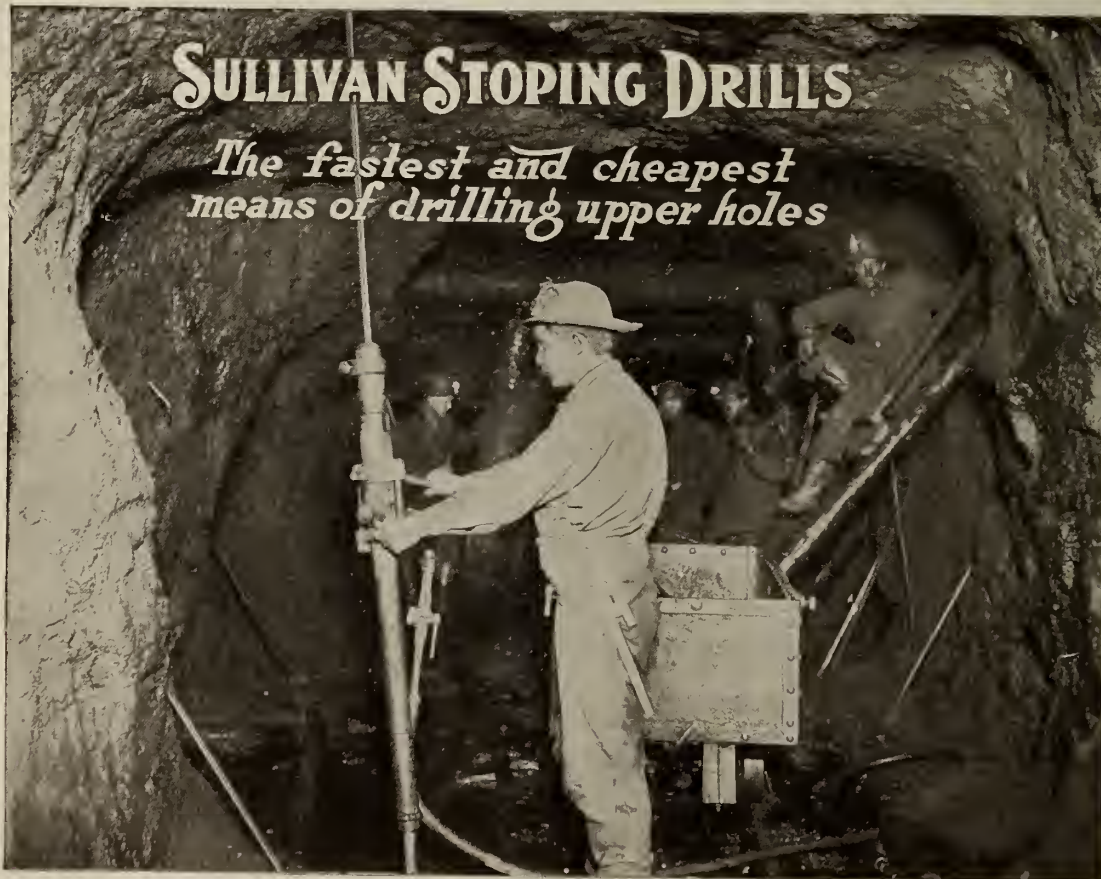
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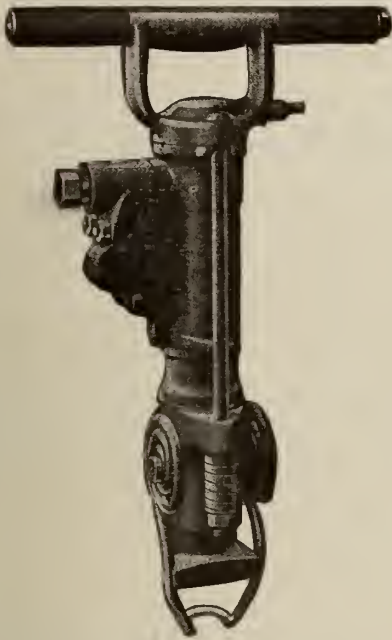
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As one user says: " . . . . . any place a man can get a foot-hold, he can put in a hole with the JACKHAMER."

The JACKHAMER only weighs forty pounds and is eighteen inches long, but it does the work of a piston drill and on 1/3 to 1/2 the power.

At the same time it requires no mounting and is operated by one man. Run by either steam or air it is an extremely practical tool for the use of contractors, miners and quarrymen.

## FEATURES

*All-Steel Construction*

*Automatic Lubrication*

*Automatic Rotation*

*Steel Holder*

*Convenient  
Hole-Cleaning Device*

*Butterfly Valve*

## WHAT THEY MEAN

*The reduction of loss of time from broken parts.  
Less repair bills.*

*Reduces wear and increases efficiency.*

*Relieves the operator of the most irksome part of his work by rotating on its own steel.*

*Materially aids the operator in keeping the cuttings moving and in withdrawing the steel from the hole.*

*Holes can be cleaned at any time without removing the steel.*

*Freezing tendencies are prevented by this unique design of valve.*

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**COMMERCIAL UNION BUILDING, -:- MONTREAL, CANADA.**

**Works : SHERBROOKE, QUE.**

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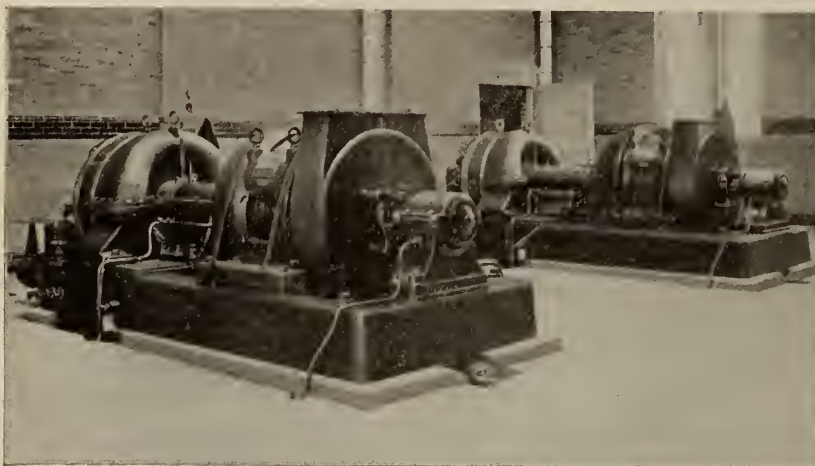
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# Fraser & Chalmers Steam Turbines



Two—750 K.V.A. Units installed in the Municipal Power Station, Medicine Hat, Alta.

## RATEAU TYPE

We specialize in turbo-compressors, turbo-blowers, turbo-pumps and fans of the above type. Over 10,000 H.P. of Fraser & Chalmers turbines have been ordered for installation in Canada.

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Large stock of Fluxes always on hand.

A full line of Keuffel & Esser's drawing and drafting material carried in stock. Brunton Transits.

**Corona Drill Steel, Cruciform and Octagon  
Corona Tool Steel—Rounds—Squares—Flats  
Bar Iron, Steel Shafting, Pipe, Steel Plates and Sheets.  
Angles**

**Carried in Stock.**

**Special Shapes and Sizes to Order**

*Get our prices before you place your order*

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Published April, 1914

# Compressed Air

## Production—Transmission—Use

By THEODORE SIMONS, E.M., C.E.

Professor of Mining Engineering, Montana State School of Mines:  
Member American Institute of Mining Engineers.

173 pages, 6x9, fully illustrated.

\$1.50 (6/3) net, postpaid.

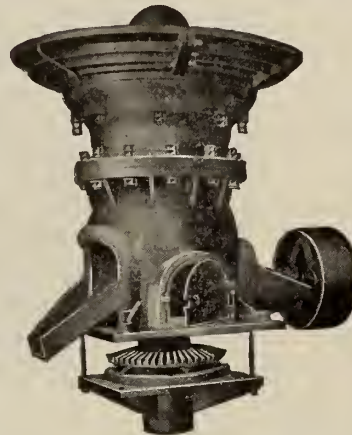
The author's aim has been to give such insight into the natural laws and physical principles underlying the production, transmission and use of compressed air, as shall enable the reader to comprehend the operation of various appliances and judge of their merit.

He does not attempt to give extensive descriptions of existing types of compressors, but only examples which illustrate the principles, and which enable the student and investigator to solve the theoretical problems arising in the use of compressed air.

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Canadian Mining Journal, - Toronto, Canada

## Gyratory Crushers



Combining the best features of existing types and our Water Cooled Eccentric Bearing.

Built in all sizes for any material.

We build a full line of Crushing and Mining Machinery, Air Compressors and Rock Drills.

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Que.

St. Catharines,  
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Sales Offices:

Halifax Montreal Toronto Cobalt So. Porcupine, Vancouver

## Synopsis of Coal Mining Regulations



COAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B.—Unauthorized publication of this advertisement will not be paid for.—58782.

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Thermo Tank  
Ventilation.

Triple Screw  
Turbine.



Montreal to Bristol

"Central Port of England."

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"Royal Edward"

R.M.S.

"Royal George"

These Steamers are equipped with the latest devices for the safety, comfort and convenience of passengers. Marconi Wireless, deep sea telephone, passenger elevators. Every room is ventilated by the thermo tank system, which warms or cools the fresh sea air and distributes it over the entire ship every five minutes. The private suites of apartments and the luxuriously appointed public cabins, treated after historic periods in decorative art, are unexcelled by anything on the Atlantic.

For Seaworthiness Unequaled.

Fastest Boats in the British-Canadian Service.

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226-30 St. James St., Montreal, Que.  
583 Main Street, Winnipeg, Man.

52 King St. E., Toronto, Ont.

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Sullivan Diamond Drills, Compressors,  
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Ore Cars, Buckets, Drill Steel, Drill  
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Fittings, Valves, Building Supplies,  
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We will be pleased to have your specifications  
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"IT WILL PAY YOU TO GET OUR PRICES."

Our Large Stock Guarantees You the Most Prompt  
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LIMITED  
COBALT PORCUPINE TIMMINS

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Shafting, Pulleys, Gearing, Hangers,  
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Chilled Car Wheels and Car Castings,  
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scription, Light and Heavy Forgings.

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A state institution offering engineering courses leading to the degree of Engineer of Mines. Located in the Lake Superior mining district. Mines and mills accessible for college work. For Year Book and booklet of views, address President or Secretary.

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SHEFFIELD

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of Every Description

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OF  
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## "ERA" MANGANESE STEEL

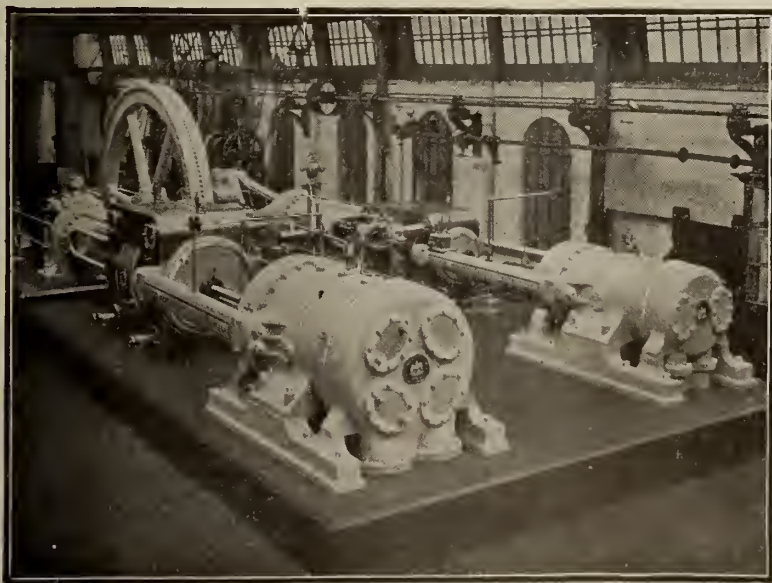
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## AIR COMPRESSING ENGINES

With Valves to Recent Patents

## THE "WALKER" COMPRESSOR

is deservedly famed for

Service, Reliability,  
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and Low Upkeep.

## Dominion Coal Company

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Glance Bay

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19 Collieries

Output—5,000,000 tons annually

“Dominion” Coal

Screened, run of mine and slack

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Collieries at Glance Bay, C.B., and Springhill, N.S.

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112 St. James Street, Montreal

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## Mining Drill Steel

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**HOLLOW**

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OCTAGON, HEXAGON, CRUCIFORM

*Prompt Service from Large Stocks*

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## FOR SALE Steam Hoisting Engines and Pumps

The following machinery has been put out of service by an electric installation and is offered for immediate delivery, f.o.b. cars Stellarton, Nova Scotia.

- 1 Novelty Iron Works Steam Hoisting Engine. Duplex cylinders, 16" diameter by 42" stroke. Geared to 2 cast iron drums 9' diameter by 56" wide. Gear ratio 3 to 1, also 6,500' of 1" steel cable.
- 1 I. Matheson and Company's Steam Hoisting Engine, duplex cylinders, 16" diameter by 30" stroke. Geared to 2 cast iron

drums 9' diameter by 54" wide. Gear ratio 2.4 to 1.

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Very low prices.

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**Acadia Coal Company, Limited,**  
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**Shot**

**Blocks**

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Prime Metal for the manufacture of Nickel Steel, German Silver, Anodes and all Alloy purposes.

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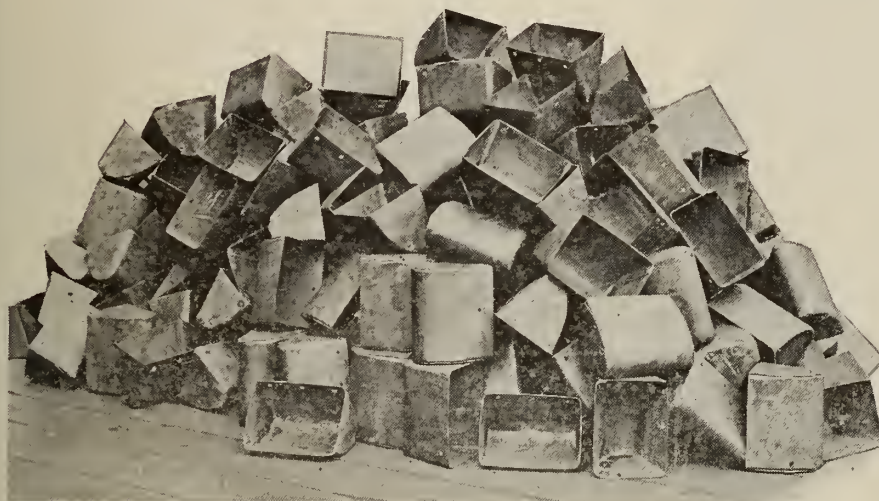
**Nickel**

(99.80% Pure)



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Any Size — Any Style — Any Number



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Waterous Steel Buckets are built to exact size, and will run easily and wear slowly under exacting conditions. They are unexcelled for handling rough and gritty materials.

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Balances  
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**Assay  
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Largest Stock  
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If we could make a demonstration for the superintendent and foreman of each different mine running stopes, we know we could convince them of the fact that the "CLEVELAND" is the best Stope Drill made—for we have been successful in so convincing every superintendent for whom we have made a demonstration, and have received his order.

A special demonstration in every mine is out of the question—but why not let us send you one for trial

### IN YOUR OWN MINE

so you can find out for yourself what it will do.

Write for Bulletin 40A

**Cleveland Pneumatic Tool Co.**  
OF CANADA, LIMITED

Successors to  
**The Canadian Cleveland Drill Co.**

Limited  
80 Duchess Street, TORONTO

# GREENING'S WIRE ROPE



Our Mining Ropes are especially constructed to suit the requirements for HOISTING or HAULING.

**Crucible Cast Steel**  
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**Acme Brand,**  
 extra high breaking strain for deep shafts.  
**Regular Lay      Lang's Lay**  
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ASK FOR OUR ROPE CATALOGUE

The

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**Manufacturers of Hammered and Rolled Steel for Mining Purposes**

Pit Rails, T Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel 3 8" to 14" Diameter, Steel Tub. Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting 5 8" to 5" true to 2/1000 part of one inch. A full stock of Mild Flat, Rivet Round and Angle Steels always on hand.

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44-46 Lombard St., Toronto

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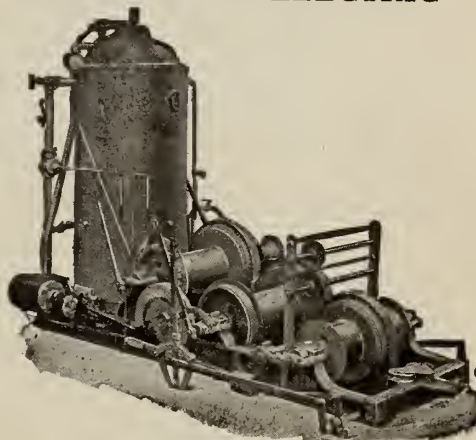
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woman's hair.  
And the fragrance of the rose pressed against  
my lips  
Is sweeter and more sincere than woman's  
kisses.  
—El-Rami.

Those Who Have read :

"The Soul of Lillith," written by Marie Corelli, no doubt have been struck by the  
cynical expressions of El-Rami as to woman's constancy. Throughout the whole novel  
there is a tone of doubt of women in general, though in discussion with Feraz, his  
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**There is no DOUBT** of the high quality of the goods we manu-  
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Take for instance **HARRIS HEAVY PRESSURE** "the babbitt metal without a fault."

We have spent years in experimenting in our chemical laboratory to produce a babbitt metal which would fill the bill in 95 cases out of 100  
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Engineers know that H. H. P. is built for service.  
H. H. P. is the best babbitt metal for all general  
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H. H. P. will not crack or squeeze out.  
H. H. P. runs cool at any speed.  
H. H. P. is copper coated and copper hardened.

We can honestly recommend it, knowing the quality is there. Our reputation and guarantee is back of every pound. Write for prices.

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OFFICE **TORONTO**

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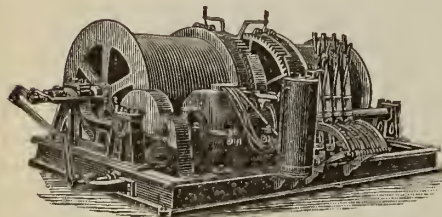


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STEAM AND ELECTRIC

Especially designed for Mines, Quarries and Contractor's work, such as Pile Driving, Bridge Building, and general Construction work.

The Flory Cableway System is superior to any on the market.



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Slate Mining and Working Machinery.

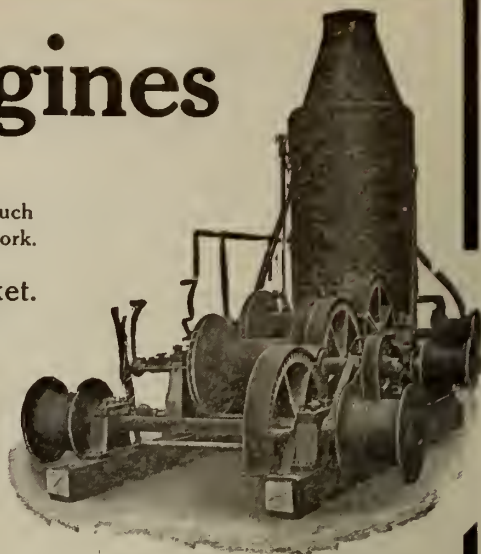
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## SISCO DRILL STEEL

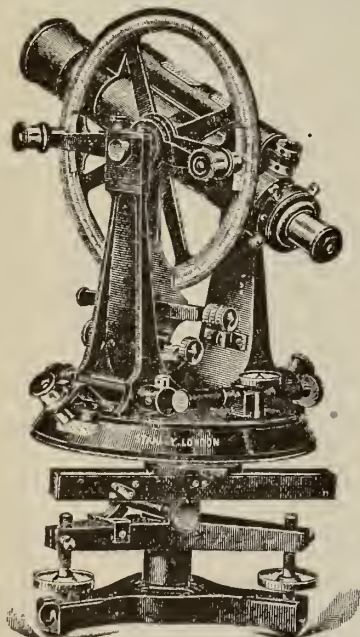
Where other steel will not stand up,  
WE GUARANTEE SATISFACTION

AGENTS FOR COBALT AND PORCUPINE  
Northern Canada Supply Co., Ltd.

SWEDISH STEEL & IMPORTING CO. LIMITED  
MONTREAL

TRADE **STANLEY** MARK

The Largest Manufacturers of SURVEYING and DRAWING INSTRUMENTS in the world.



Stanley's New Model Transit Theodolite.

DRAWING  
OFFICE  
STATIONERY  
of all kinds supplied on the most favourable terms.

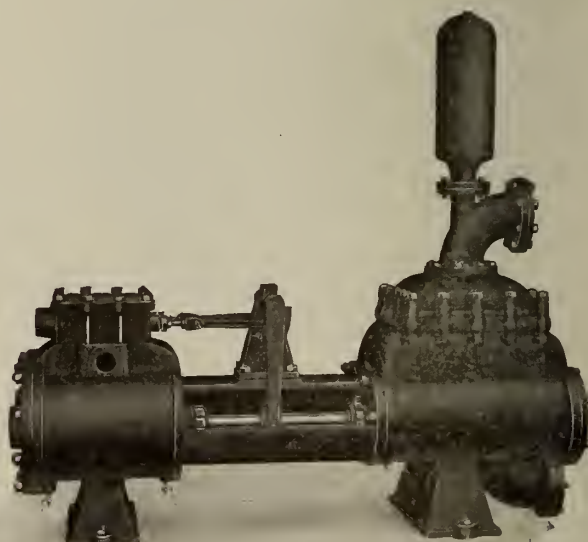
A very large stock kept.

Please send for our "K" Catalogue, and compare our prices with those of other FIRST-CLASS makers.

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Save miles of walking—save valuable time—minimize accidents. Our nearest house will tell you how Northern Electric Mine Telephones will

**Increase Efficiency**  
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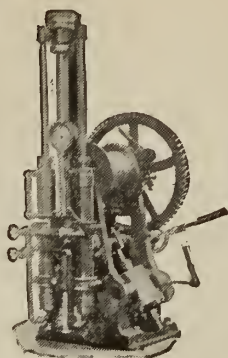


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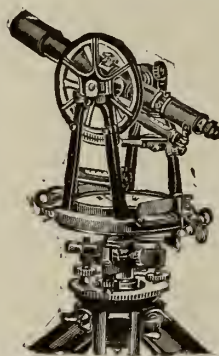
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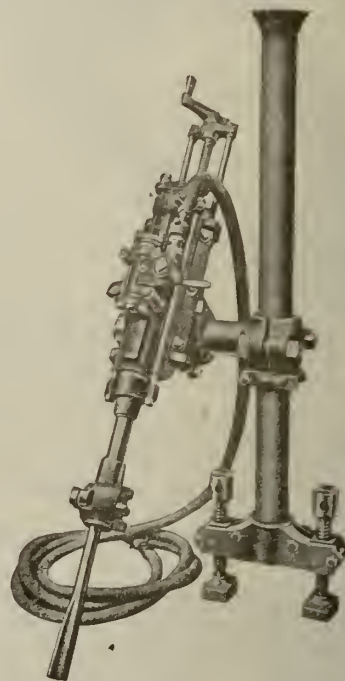
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# THE CANADIAN MINING JOURNAL

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No. 13

## The Canadian Mining Journal

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## THE HILLCREST DISASTER

One of the worst accidents in the history of mining in Canada occurred at the Hillcrest colliery in the Crowsnest district on June 19. Two hundred and thirty-seven men went down to work in the mine and only forty-eight returned alive. In spite of the heroic efforts of many willing and experienced workers a very small number were rescued. One hundred and eighty-nine lives were snuffed out.

It is very clear from the reports that have reached us that the rescuing parties did their utmost. In the face of great danger they went into the mine and brought out the unfortunate men. With oxygen breathing apparatus they carried on the work as long as possible and we have every reason to believe that many risked their lives to save their fellows. It requires courage of the highest sort to do such work and the greatest praise is due to the valiant band of men of all stations who so willingly did all they could.

The cause of the disaster is not, as yet, clearly understood. An investigation will doubtless be made to determine the cause, and we can only hope that the investigation will be a rigorous one and that every necessary step will be taken to avoid similar awful accidents in coal mines. There have been recently in coal mines in Great Britain and the United States some equally horrible disasters. While many advances have been made in increasing safety underground it is obvious that there is still necessity of insisting again and again on the investigation and removal of the causes of such accidents.

Unfortunately investigations are never completely satisfactory. There are always many contributing causes and it is difficult for the most experienced coal mining authorities to determine them and analyze them correctly. Nevertheless, every effort should be made and some valuable information is sure to be obtained.

## ONTARIO'S SILVER OUTPUT

The report of the Bureau of Mines of Ontario for the first quarter of this year shows a production of 6,519,860 ounces of silver. This is 680,198 ounces less than in the corresponding period last year.

In 1904 the silver mines at Cobalt produced 206,875 ounces of silver. In 1905 they produced 2,451,356 ounces. In the next few years increase was very rapid until in 1910 the production was 30,645,181 ounces. A slight increase was made in 1911 when 31,507,791 ounces was produced.

Since 1911 production has been declining. In 1912 it was 30,719,883 ounces, and in 1913 29,681,975 ounces. A larger decrease is expected in 1914.

Ontario has produced since the Cobalt deposits were discovered in 1903 about 200,000,000 ounces of silver. The Cobalt mines are not expected to make as large annual outputs as in the past few years, but they are expected to make a large production for many years to come.

### MINING LAW REVISION.

In a contribution to a discussion of a paper presented at the March meeting of the American Institute of Mining Engineers, Mr. J. B. Tyrrell, of Toronto, says of the attempt made to draft a mining code for the Dominion of Canada:—

"The Dominion of Canada does not own all its wild land. Most of the various Provinces, like many of the States, own their public lands, so that the Dominion only owns a certain proportion of the more distant vacant land. These lands are covered by the Dominion mining law. A few years ago the Canadian Mining Institute suggested to the Dominion Government that it might be allowed to co-operate with the Government in the drafting of a new mining law for the Dominion, in the hope that such a mining law might not only be useful to the Dominion of Canada itself, but might also serve as a model for the various Provinces of Canada, and that sooner or later the Provinces would pass laws which would closely approximate this model law which we were to draw up. The Dominion Government threw the responsibility back on the Canadian Mining Institute and said to it: 'You draw up the Act, and if possible we will pass it for you.' That was under a Government which two years ago went out of power, and since the new Government has come into power, while it has considered our draft sympathetically, it has not passed it into law. We hope it will take that draft into consideration during this year and enact it into law, because it embodies, as closely as we can determine, the kind of law which we think would be best for Canada.

"Now, the constitution of the committee that was appointed to draft this law was about as follows: We chose three or four of those actual mining members of the Canadian Mining Institute whom we thought had most experience and were most competent to express opinions on what a mining law should be. We also added a couple of lawyers to the committee, who were to furnish the legal assistance in doing the work and in putting the drafts into proper legal form. It was not their duty, nor did they assume, to dictate what that law should be, but they were to assist us in framing the law; so that it would be a law which would be considered as being properly drawn by the courts.

"I am not going to give you any synopsis of that draft. It is still a draft, though we hope to have it enacted into law this year. Whether it will be or not, I do not know. But what I have said may give you some idea of the way in which we undertook the preparation of it. We have endeavored to draw up a mining law for the Dominion of Canada, covering the Federal lands, which we hope will serve as a model, and be copied by the Provinces as soon as possible, so that we will have fairly harmonious mining laws throughout the entire Dominion.

"In Canada, we do not sympathize with the apex law, which as I understand it, was a product of an erroneous interpretation of Cordilleran geology. Leaving out the ore-bodies in the Rocky Mountains and considering only those occurring in the Pre-Cambrian and other great formations throughout the eastern portion of the country, I do not think that the apex law would have suggested itself to anybody."

### WASHING OIL WELLS.

Mr. Arthur Knapp in a communication to the Secretary of the American Institute of Mining Engineers says: "I believe that the washing of a well with clear water is, in general, a very bad thing. There are probably formations that will stand up after being washed with clear water, but my experience in California and elsewhere has been, that to wash a well with anything but a well-mixed mud would stick the casing before cementing could be accomplished. The mud is the only thing that will wash the oil out of the hole and hold back the gas. Neat cement is heavy enough to displace the mud adhering to the casing and give the desired contact between cement and casing. Further, any well in which the circulation cannot be established in 3 hr. is not in a condition to be cemented. The casing should be removed and the hole reamed. Circulation for a long period of time serves only to cut deeper channels around the casing and does not clear the entire circumference."

### GRANBY.

Boston.—President Nichols, of Granby Consolidated, sends this word to stockholders with dividend checks:

"The three furnaces of our new smelter at Anyox are now running. Naturally some time must elapse before the exact amount or cost of our normal output can be known, but no unexpected difficulties have been disclosed either as to mechanical appliances or as to character of the ores. The shipments of copper so far received are of unusual purity and the value of precious metals content exceeds our expectations. Some inconvenience and delay has been suffered through the action of the Canadian Government in restricting immigration, but it is not expected to have any permanent effect on our estimated labor cost. Operations at Grand Forks and Phoenix are proceeding as usual."

It is expected the Millie Mack, situated in the mountains east of Burton, on Arrow lake, will be worked again this season, the owners having recently visited the property.

The total quantity of ore received at the Consolidated Mining and Smelting Co.'s works at Trail during four weeks ended May 28, was 26,583 tons, this consisting of 21,469 tons from the company's own mines and 5,114 tons of custom ores, the latter including 912 tons from the neighboring State of Washington.

The Queen's Head Mining and Milling Co. is having a survey made preparatory to driving an adit at a lower level than any of the existing workings on its Hartney group of mineral claims, situated on the mountain above New Denver, Slovan lake. Mr. J. D. McMaster, of Rochester, New York, managing director, is in local charge.

The traction rope of the old Last Chance aerial tramway is being replaced by a new steel rope 12,956 ft. in length and weighing 8,555 lb. The tramway is now used for taking up supplies to the Surprise mine, above Cody, Slovan, and for bringing ore down for hauling to the railway at Sandon.

Mr. J. D. Galloway, assistant provincial mineralogist, has gone to Hazelton, Skeena Country, B.C., to make that place his starting point in connection with an investigation into mining properties and conditions along the route of the Grand Trunk Pacific railway thence eastward to the British Columbia-Alberta boundary.



# LONGWALL MACHINE MINING\*

By J. F. K. Brown.

The greatest modern advance in coal mining of late years has been the introduction of machinery to undertake the work formerly performed by the miner underground. This applies to both longwall and the pillar and room systems; but, as continuance of operation is a large factor in the economical working of machines, longwall systems present the best field for their use. In room and pillar methods, a regular succession of varied operations takes place within a short time and the tonnage in each place is relatively small, whereas in longwall working many tons are handled. This gives the machines a continuous work period and so provides the best conditions under which they could be operated. Machine mining too offers the only antidote to the ever increasing wages cost. There is also the advantage of more systematic working methods, with a consequent increase in safety and efficiency. For these reasons alone it is probable that longwall operation will be the more largely utilized system in the future even under conditions which otherwise might be said to favor the pillar method.

## Fundamental Problems

To such an extent has machine mining altered mining conditions that there appears now no special problems limiting its possibilities. But there are two factors that have a very large influence on its success, viz,—the roof and a question of organization. By the roof is meant not the few feet of stone immediately overlying the coal; but the succession of strata within 50 feet or more above.

As an illustration, imagine the conditions in any old hand mined longwall working, set out without regard to the roof. Naturally through various causes certain places fall behind others, some stone pillars are built solid, timber is left standing in the waste. From all these causes troubles arise. One miner says his coal is hard and demands extra rates, another fills nothing but small coal, falls are numerous and seem to occur regularly at one or two points, more timbering is wanted at each road head, at various points the pavement requires to be lifted. In other words, due to the overriding weight of the strata above, lines of force are produced which run anyway, and local pressures come into existence at certain points whose position is determinable by the relationship between the line of the coal face, the distance apart of the roads, and the areas open supported and unsupported. The man in charge of such a section usually blames the roof—quite correctly too. But he should realize that it was his method of working that caused the roof to act in such a manner.

The introduction of machine walls and conveyor operation demands straight lines in the coal face, and that the needed supports be placed at stated intervals running in both directions. Regularity becomes the fashion, with the result that equal pressures, lines—unknown under former conditions—develop parallel or at right angles to the line of the coal, and can be taken advantage of in operation. The power that is in the roof becomes a help instead of a hindrance. Safety is increased: if you know what a roof will do you can within limits prepare for it. No two roofs are alike in the weight exerted, the type and direction of break or the swing of the loosened strata; but once regularity

of working is established they may each be expected to exert their several powers in the same way. And to gain the best advantage of this regularity in roof pressure a knowledge of all the underlying principles that cause these phenomena becomes a matter of first importance.

Next to a proper understanding of the roof comes the organization of the underground operations. System in every part of the work is much needed and it must be almost military in its exactitude. Let a man or a machine fall behind in his time for the task allotted and the whole routine becomes disjointed. Should a coal cutter be three hours overdue in finishing its run men have to wait before they are able to turn over their coal. When the end of the shift appears, this coal has still to be loaded, extra men have to be procured and finally the machine starts the next shift again behind time, one loss accumulating on the other.

## Coal Cutters

Undercutting by machine has advanced so far as to now allow the mine manager a varied choice of machines, although they can all be related to one of three accepted types, viz,—disc, bar and chain. Details of construction cause variations in the appearance of the machines of different factories, but the essential features are the same. Each type can be air driven, or electric, and neither on skids or wheels. Haulage along the face is accomplished by a rope and gear passing in most cases under the machines.

Certain special advantages are attached to each machine, which are worth considering. The disc machine is the heaviest and fastest worker. The disc generally makes a better cutting arrangement, and its shape and action produce dross in the cut which is cleaned out by the machine itself.

Against this there is the disadvantage in a soft coal or fireclay of the disc becoming jammed by the coal falling down upon it or the cutter wheel being clogged. In many cases this has caused great delay, as the getting out of blocks of coal hidden behind the machine in a thin 18 in. seam is an awkward task. Many troubles of this character limit the cutting time of a disc. Neither is it adapted to working into the coal by itself at the commencement of either end of the cut, and places have to be specially prepared for it by hand labor.

When using a bar machine, the bar being only 4 in. in diameter, the coal even should it fall on the cutter does not stop the progress of the undercutting. The design of the mechanism places the cutter bar at one end of the machine, and as it has a swivel action through about 180° it is possible for this machine to cut its own way into the coal at the beginning of the cut, and, if turned, at the commencement of the return journey. In working, the bar produces "gum," a very fine powdered coal. Generally bar machines seem to be more dusty than disc cutters although this would depend on the class of coal. The noise of a disc cutting is much the greater and by comparison a bar running often appears quite an "abode of silence," but the claim sometimes made for the bar that it enables the working of the roof to be heard can hardly be considered.

\*A paper prepared for the annual meeting of the Mining Society of Nova Scotia, 1914.



The chain cutter occupies a position midway between these two and while supposed to have none of the disadvantages of the other types, appeared in a number of cases in the early days like having very few of their virtues either. Through experience it is not a type that is particularly popular in most coal fields in Britain, but having been better designed has been very successful in the United States. This type of cutter using the travelling chain has one main advantage over the disc, for being narrower in the cut and being able to cut its way into the coal itself in a similar manner to the bar.

Machine mining it is understood has the following general economies:—

(a). A much increased output is obtained from the same area.

(b). The undercutting cost is less, by the large increase of output per man.

(c). Owing to better and advantageous control of the roof, the cost of timbering and explosives are both reduced.

(d). Better coal is produced, less slack being cut by the machine in comparison with hand mining.

(e). There is greater safety at the face.

### Changed Conditions in the Mines

The most important point is the recognition by management and men of the changed conditions introduced in the mine. The following remarks, apply equally well to conveyor and loader conditions:

**The Workings.**—As the conditions which prevail under hand mining are in the majority of cases quite unsuited to machine work, the workings must be properly prepared before commencing. Everything possible to expedite this should be done, for with machines a certain amount of work has to be carried out within a definite time. The men must be well arranged and know exactly what is required of them. The roads should be short and well graded, as about three times the tonnage has to be handled with certainty under the new conditions. If the regularity is not maintained, a loss of a night's cut is the usual penalty, and a succession of such defaults will soon make the machine a costly innovation.

**Opening Out Machine Walls.**—Opening out machine walls if done by hand is slow and tedious work, and in modern practice the machine itself is frequently used either by running a bar and increasing the face in a semicircular form, or using a disc and carrying a short machine wall direct to the dip. In a face of this character one end of the wall should be in advance of the other so that any water made will gravitate to one point in the workings. By making the machine operate with a deep cut in these short opening out walls, the coal is easily broken down and a considerable tonnage results.

**Depth of Undercut.**—This is a matter of experience and opinion, and is mainly governed by the best depth at which the coal will break easily yet not too readily, so as to avoid any breakage of the coal in top of the machine. Three feet three inches is a common undercut, but with American chain machines six ft. is more usual.

**Holing.**—As a rule this is done in the bottom of the seam, for the same reason that the miner undercuts there, taking advantage of the roof weight. Holing in any dirt band that may underlie the coal is not always advisable, as it sometimes leads to trouble in filling; and except in very thin seams where height is much needed, holing is best done in the coal. Cer-

tain conditions such as a band of bad coal, a soft clay higher up in the seam, may cause holing to be done there; but care should be taken that the portion below the holing has a good parting from the floor. Otherwise trouble will result in lifting this pavement coal.

**Working Operations.**—The usual practice is to undercut at night, the coal being filled during the day. Machines can cut two ways: back and forward each alternate night, and a certain length of face; or only in one direction, the machine being run at the end of the shift from one end of the section to the other. This latter part of the work known locally as "flitting the machine" is an awkward and costly operation, and is seldom applied now-a-days unless in thick seams where it takes more than one shift to clear away the coal. In some collieries where conditions are good, as many as five cutters follow each other in regular succession over one long face.

**Height.**—This condition only applies where thin seams are operated, and when it gets down to 18 and 20 in. sections every inch counts. By using skids a few inches is gained over wheels. With thin sections the cutting must be kept at the pavement since any coal left has to be afterwards lifted in order to maintain the height causing extra work. In using coal cutters in thin seams provision should be made for any likely decrease in section.

**Operating.**—In getting ready to start cutting, the coal face from end to end should be as straight as possible. Usually, however, a longwall face gradually assumes an almost semi-circular form, and where the outlet road of the section is in the centre this form suits just as well, although it is apt to cause faults in the roads owing to the tendency of the lines of roof pressure to converge. A straight line face permits of the weight being more evenly distributed and brings down the coal in a regular manner. Seams exist where the pressure can be regulated, so as to allow the coal to fall without blasting a few yards behind the machine. Timbering should also be regular, each prop being a measured distance from the coal and from the next in line.

**Direction of Working Face.**—This is mainly determined by the inclination, except in those cases where the cleat of the coal is extra well developed. As a general rule undercutting by machine is independent of the advantage of cleats owing to the use made of the roof weight. Usually a machine is run on the dip to rise run; but it sometimes happens that, at right angles to this, if not too steep, or any angle between the two, the coal may break out easier in large blocks, and so reduce the small coal to a minimum.

**The Length of Face.**—The amount of coal to be stripped off chiefly determines the length of the wall, together with the time that can be given to doing it. Where a machine cuts the coal every night, the length must be such that there can be no doubt but that the coal can be cleaned away rapidly in the following day shift. What is called back or after stripping is to be avoided, and sometimes too long a wall leads to the waste of much coal being thrown out of the way to allow the machine to proceed.

**Stripping.**—Steady men should be employed to work as loaders and provision should be made to always have some reserve of men to draw on. Loading should commence in the road head by a breaking in shot and after that work continues filling out each day. The space allotted to the pair of men should only be



what they can reasonably handle and in thin seams 15 yd. is enough. The success of a machine depends not so much on the length cut, as on the regularity of cutting, hence the importance of the stripping.

**Inclination.**—The amount of inclination of a seam has so far proved no disadvantage to the coal cutter and machines are at work in seams dipping as high as 40°. Under these conditions working to the dip and rise of the seam is a necessity, while the machine instead of a haulage rope on the down rise will require a brake rope in its place. If working across the inclination is attempted, the machine has to be well propped up to its work, not an easy matter. If cutting down it is apt to be diverted in the cut.

**Timbering the Run.**—This depends on the nature of the roof, slips, and the strength of the coal. About 5 ft. is needed for the passage of the machine. A line of props outside this is sometimes not sufficient to hold the roof. In that case either a row of props in the path of the machine, to be withdrawn and reset as the cutter passes, or a set of straps will be required.

**Working the Machine.**—The running of any cutter should be under the care of a careful and steady workman. Probably in the past there has been no type of machine so subject to hard usage. Machinemen must be able to make slight repairs, and keep the cutter in good running order. Their shift should start at least an hour before cutting commences, in order that all details be well overhauled. When running, their duties are to guide and control its movements. The man behind attends to the air connections, the cleaning out of the small coal, and the setting up of the props. Generally speaking it pays to provide men usually known as strappers—whose duty is that of timbering the machine run in advance of the machine, and whose shift should commence at least four hours before the cutter. Where the work of the coal face is divided like this into piece work, men become very expert at the portion of the task assigned to them, and the general efficiency rises, all of which tends to the success of the coal cutter.

Regular reports should be made day by day by the machinemen of progress, time lost, reason of delays, and these form a valuable means of comparison and control.

One of the earliest coal cutting collieries was at Gartness, Lanarkshire, Scotland, in 1880, sixteen years before the bar coal cutter began to come on the market. The seam was 30 in., and the machine a disc operated on compressed air, cutting 150 tons per day. The cutting contractor was paid 7 1-2c per ton, and for this he made ready the machine, drew any wood in front, set up any temporary props, reset wood behind machine, cleaned out the "gum", made holing, put in any spraggs, did the cutting and changed the hose pipe from road to road. Four pipe roads in 16 walls were needed. Filling out the coal was also under contract, and paid at the rate of 10 cents per ton, this including blowing down coal, filling and setting up wood. The capital cost on plant amounted for two cutters—each costing \$973.00—to \$11,499. In its day, this machine known as the Rigg & Maillejohn, was a very efficient type and could be bought at a price nearly \$730 below the present figures. The price of a modern machine now runs from \$1,600.00 to \$2,500.00, according to size and type.

### Conveyors

The second type of coal mine labor saving device to be developed was the conveyor, which originated in the desire to obtain a better and more economical

method of handling the coal produced by the coal cutter. With machine undercutting 30 to 60 per cent. of an increase in output is obtainable from the same area, and in many cases existing methods proved inadequate to the demands made upon them. It is, however, only fair to say that one type of conveyor was in existence before coal cutters were operated.

Conveyors like the coal cutters are mainly of three types: shaking, intermittent and continuous.

Curiously enough the shaking type has mainly developed from Continental practice, the intermittent conveyor is typically Scottish, and the continuous jointly American and English.

The first type is the oldest and in its original form has probably been in use for many years, having probably attained its greatest development in the pitching longwall seams of the Belgian and Calais coal fields. At first the conveyor consisted of a series of plates laid down on the pavement on which the coal slides by its own gravity into the waiting tram in the level below. This properly speaking is only a device to aid the flow of the material; and can hardly be said to convey the coal in the modern sense of the term. The next step was the substitution of trough lengths of semi-circular plates being on chains attached to posts placed alongside. At the bottom a cross bar stood just short of the full swing of the trough which might be say 12 in. This bar acted as a stop or bumping post and so there developed the "bumping" or swaying conveyor, and lengths up to 150 ft. were operated in this manner. Considerable breakage of the coal took place and dust was readily made. Out of this the conveyor or "coulior" of the Belgian fields developed and is largely in use to this day. It is a power driven conveyor built up of plates about 12 ft. long, 13 3-4 in. wide and about 3 in. deep. This type acted in the same manner as a sloping screen and was supported on roller bearings, or rods.

The more modern representation of this type is known under various names and general arrangement operation turns upon the same idea as that employed in horizontal screens of the Baker type. The plates rest on rollers running in turn in semi-circular channel irons on the floor. The conveyor is given a to and fro motion and through that obtains a rapid up and down one not produced by the motor being rigidly attached to the plates, but usually through the operation of a rope. One or two conveyors can be operated by the same engine.

The main advantage of the shaking conveyor is its cheapness in first cost, and the ease with which it can be moved. Its disadvantage is its tendency to produce dust.

Of the intermittent type several examples are in use, all developments of face haulage systems. The simplest of all is a long low car with dropping doors in the bottom. Rails are laid along the face and stretch over the road head, the car being run out by a rope attached to the front and back end, and driven by a small double drum engine in a similar manner to a "main and tail" rope haulage. When driven over the road head the bottom doors swing open, and the coal drops into the box below. Except in thin seams this type has no advantages over any system of face haulage.

An extension of this idea introduces the Thompson, Gibb and Ritchie conveyors. The first two of these consist of a series of low boxes or one long box which is operated by a rope and engine in a similar manner to the single car type already described, but the meth-



od of discharge varies. In the Thompson type the car has only one side and that furthest away from the face. The total height on the coal side is only nine inches from the floor. This long car when drawn over the road head passes under a scraper set at an angle which deflects the coal off the travelling plate and into the box below. A Thompson conveyor usually fills out of two stretches of workings operated by a central road, loading first the one side and then the other.

Within the Gibb conveyor there runs an endless chain which is brought into operation when the conveyor comes against a buffer situated in the road head. The same rope gear that draws the conveyor along the face operates the discharging chain. This conveyor is made with discharging gear at both ends, the chains working either way and so any lengths of face can be worked but two outlet roads are needed.

In the Ritchie conveyor the trough extends the full length of the face being operated, while the discharging arrangement only extends one quarter of this distance. In this case the discharging gear is a wire belt drawn backwards and forwards in the troughs by a rope and which at the discharging end coils itself upon a drum spilling the coal into the boxes.

While these conveyors have the advantage of being more or less independent of an undulating floor, they possess in their turn the disadvantage of only serving one portion of the coal face at a time, and like the system of box loading they were intended to supersede, each miner had to await his turn to handle his coal, more or less time being lost in loading.

Of the continuous types there are three, viz.—the Allardice, Sutcliffe and Blackett. In the Allardice a flat link chain at 9 in. centres equipped with wing scrapers every three feet runs in the usual series of iron plates. This is provided with suitable driving and tension pulleys at either end, and the chain returns overhead being supported on bolts attached to the timber and about 9 ft. apart.

The Sutcliffe represents the application of the conveyor belt to underground use. The belt is either leather, balata or wire cloth, usually the latter, and runs in troughed rollers. A tension gear is used at the top end, and driving gear at lower end.

The last conveyor to be described was brought out simultaneously in America and England, but somehow seems to have found the greater field of its operation in the latter country. A link scraper chain is employed to run in a pan, the return being underneath. This makes the sides of the conveyor higher than most conveyors in operation, usually 15 in. from the floor. The pans are six feet in length easily put together and approximate 8 in. across the mouth, 8 in. sides and 14 in. in the bottom. A tightening gear at the top end of the conveyor is a matter of importance, otherwise the coal gets under the chain, causing it to rise out of the pan, and the coal falls over the side. For this reason all these conveyors are supposed to need a level floor, but the writer has seen a Blackett working through and regularly shifted over a 2 ft. 6 in. fault.

With all these types of machines in operation it is a long task to go over minutely their special advantages. Each like any other class of mining machinery is bound to have its own advocates. Type No. 1 has the advantages of cheapness, and simplicity in construction and operation. No. 2 suits seams with undulating floors, and is very easily moved from position to position, while No. 3 is greater in first cost

but produces a steady and regular delivery of the coal at the road head.

All have been designed and operated for the purpose of reducing costs, and do or attempt to do by delivering the coal at one particular point in the workings. This has the following advantages:—

(a). The concentration of the machine output at one point where proper preparations can be made to meet it.

(b). Only one or two roads are needed in each section. This represents in many cases a big saving in costs of building and getting down the roof and repairing, say 10 roads as against two.

(c). The disappearance of lines of roof weakness due to road bushing and consequent continuance of the policy of roof control first introduced with the machine.

(d). The steady systematic timbering giving greater safety.

(e). The increased output per man due to greater care in loading and consequent reduction of costs.

An advantage sometimes claimed is the larger proportion of round coal brought out from the face, but this is doubtful, and likewise the disadvantage often stated of more dust produced in the faces does not seem to be borne out in practice.

### Operating Conveyors

In operation a conveyor follows much on the lines of a machine wall. The face must be straight, and with certain types without undulations. When machine and conveyor are both in use regular propping is required as space is needed, for first the machine and then the conveyor.

The main haulage road to deal adequately must be double width to allow of a double track and should be kept in advance of the usual face line a distance of 50 ft. or thereabout. This provides a space in which to manipulate the large number of boxes required for loading. These boxes have to get under the conveyor head so the pavement of the seam is lifted to a depth sufficient to allow this. As a rule this pavement is lifted every third night while the machine is cutting. In order to avoid having to keep a road in advance of the usual face line, a second short conveyor always of the continuous type has sometimes been used. The face conveyor discharges at right angles into the road conveyor, and it in turn raises the coal a sufficient height to reach the boxes. An ingenious turntable has been used with this second conveyor, rotating the tubs from one road to the other in front of the discharge end. It had the advantage of causing no cessation of loading due to shifting and putting in a fresh trip of boxes. With the road conveyor a double road is required just the same, one line being occupied by the conveyor and the other by the empty boxes, and any extra height required is obtained by taking down the roof. Just how essential it is to have a good system at the loading end is at once seen, when it is considered that 400 boxes may have to be dealt with there in one day.

In seams with any inclination, a second bottom road, parallel to the loading road, is good practice. This is due to the tendency of the roof weight to slide down hill, and this second road placed below the loading road acts as a safety valve, into which roof pressure can exhaust itself without causing excessive crush of the working level.

Shifting the conveyor is an operation usually carried out at night while the cutter is running. Six



men on the average are sufficient, depending on the length and type of conveyor, and one or two conveyors may be shifted each night. Sometimes this work is performed on contract.

As with the machines the success of conveyor working depends on the recognition of the principle that the workings must be arranged to suit the conveyor and not vice versa, and system plays a large part in operation. It would be poor policy to concentrate 200 tons at the road head and then have no proper means of taking the quantity to the shaft. The same remark applies to the timbering and loading. Using machines and conveyors, the operation of the roof being steady and continuous, it is possible to set the necessary timber at regular intervals and in line. Such a practice facilitates both the working and shifting of the machines. Where there is much timbering required this is best done by special men who should be attached to the squad detailed to shift the conveyor. In working it is essential that all the coal cut must be filled out to make room for the next machine run, and should any loaders not turn out others must be found to take their place.

While a conveyor is usually considered in conjunction with a coal cutter it is not necessarily so, and there are a number of mines where considerable success has been attained when used alone. The following particulars were taken when mining was conducted with Blackett conveyors only.

The coal seam worked had the following section.

Coal .....	10 in.
Stone .....	1 "
Coal .....	9 "
Stone .....	12 "
Coal .....	17 "
—	
Total height .....	49 "
Coal 36 in.	

operated on the longwall principle. Deeps were driven on the straight inclination of 150 and levels broken off every 300 ft.; after a full pillar of 60 ft. was turned each level was connected, and longwall commenced, until operations appeared somewhat as shown on the sketch. One section followed another in regular succession, in all 8 Blackett Conveyors were in use. Faults of 2 ft. 6 in. and 18 in occurred in two sections but presented no difficulty during working. The tonnage per man rose from 3.75 to 6.2 and the advance of the faces from 160 ft. in six months to 260 ft. Only 16 roads all told were maintained for a former 66. The saving in cost amounted to 20c per ton. Working was carried out by contract, contractors having one section apiece, and as each section was an exact replica of the other, a bonus was sometimes paid for highest tonnage produced. Over and above the total reduction in cost actually attained, it is easily seen that there are advantages to the management in this system in the concentration of the output in the one quarter, and the consequent less dead work, and lower supervision cost implied. Ventilation was also simplified.

Generally speaking the saving in cost obtainable using conveyors is variable, and although some figures together with the conditions of working are given in the table attached it is not possible to compare conditions in any way. Every case must be considered on its own merits, measured against some known performance and so the figures given only show what can be accomplished by using this working method.

### Loaders

The next type of labor saving device in natural sequence is the underground mechanical loader. So far it has only developed slowly, and it is but little beyond the bare idea. Before describing the machine in existence it may be possible to consider the conditions to which in longwall they would have to comply.

In the first place loaders can only economically be used in conjunction with conveyors, or some system of face haulage. A machine wall may produce from 150 to 300 tons of coal lying in one straight line, so that loading becomes a continuous operation. Considering that filling by hand gives about 6 tons per man, under coal cutter conditions, and the loader can average 20 to 40 tons per hour, the whole face can easily be cleaned up by the one machine and two men instead of 30 to 50 men. Not only this but a machine cleans right from one end to the other, and consequently the coal cutter can immediately follow up the loader. By this means the rate of progress is very nearly doubled, and likewise the output from any one section. It ought therefore to be quite possible to obtain 500 tons per day from a 100 yd. face, and this should be produced by the machine, and a squad of 10 to 12 men, bringing the tonnage per man up to 20. Given an allowance for interest and depreciation on the combinations of machines used, the cost of production cannot help but be low. Further the system has the great advantage of concentration of output, and would help to solve a pressing labor problem. To be successful a loader needs therefore to have sufficient propelling power of its own to give it at least the same progress as the wall cutter, namely something around 15 in. to 20 in per minute. About double this would be better practice, since this would allow for any loss of time due to breakdown, and also give the machine an opportunity to exercise the reciprocating motion essential in the thrust in shoveling.

Neither skids or wheels appear very suitable to a loader; with wheels two tracks will often be needed; with skids progress must be in one direction and the machine cannot back to take a special thrust forward. At best a loader has to travel over a rough floor, and possibly the best arrangement to suit all conditions would be a design using either a caterpillar or endless chain tread. Loading for longwall purposes must be sideways to the passage of the machine, and the machines themselves will require to be built as low in height as the coal cutter has been designed. The thrust forward of the shovel is an important point; this should be as great as possible, and so an engine which provides a large margin of power is much to be preferred. The actual shoveling principle is a matter of choice dictated by the limiting space, and can doubtless be either intermittent or continuous.

So far as the writer knows there is at present only one loading machine being applied to longwall coal mining. This is the Myers-Whaley.

This machine consists essentially of two conveyors, and a revolving shovel, the whole being mounted on a truck. It consists of two parts an inner contained within an outer shovel. The outer shovel fixed on a crank shaft and provided with removable teeth similar to steam shovel practice, in revolving forward, digs into the coal, and as it turns upwards completing the revolution the material slides back into the second or inner shovel. As the revolution continues two cams



on the outer shovel force the inner one to rise and revolve until it in turn discharges on to the first conveyor, hence to the second, and so to the car. The machine is pivoted in two places, the front conveyor and shovels revolving laterally 8 ft., 6 in. to 10 in. on either side of the track, depending on the size of the machine in use. The rear conveyor is also capable of swinging so as to facilitate the loading of cars alongside the machine on a parallel track.

This loader is at work in seams averaging 54 in., 78 in., and 64 in. of coal, and in the latter case in long-wall workings. The principal dimensions are:—

Weight, 6,000 to 7,000; track gauge, 24 in.; length, about 19 ft.; over all width, 4 ft., 5 in.; wheel base, 30 in.; reach, 8 ft., 6 in.; maximum height, 38 in.; width of shovel, 28 in.; power consumption, 7 1-2 h.p.; tonnage handled, 1,750 lb. coal per min.; thrust of shovel, 3,000 lb.

The larger sizes are heavier but load correspondingly more material. One of the most interesting things about this loader is the small horsepower as compared with the average of other types of labor saving machines, but this naturally depends on the duty being performed.

In a mine in Virginia the loading machine follows next after blasting, working up a 4 per cent. grade—the cars being dropped down by gravity. On the side next to the working face, the operator sits on the machine and most of the shoveling is done on that side. The cars are brought alongside the machine in trips and loading is practically continuous, any coal which rolls as far as the car track is turned back by hand to allow the cars to run. So far the machine is now loading out about 200 tons a day, which it is expected to increase to over 250 as soon as the men and management can make the necessary arrangements. All this loading is being managed with a crew of four men, and if the results are arranged in the form of a table some striking figures are obtained which bear out the suggestions made earlier in the paper.

	By Hand	By Machine Cutter and loader
Tons per day .....	80	200
Advance of face per day .....	1'	6'
Number of men .....	27	..
Number of men on coal cutter ....	..	2
Number of men on coal loader ...	..	4
Number of extra timbermen .....	..	4
No. of tons per man .....	3	20
Ratio cost per ton .....	5	1

From the above table it will be easily seen how the tonnage per man can increase by the use of any properly designed loader, and how complimentary an adjunct they are to machine cutting and conveying. If cutting and loading took 10 hours each and both could be operating at the same time it means that the output can be doubled in the one section with the addition of six men to the operating force.

To the actual cost there is to be added, as in all cases a percentage for depreciation and interest on capital. The purchase price of these machines is somewhat heavy, running from \$3,000 to \$6,000, depending on the size required.

This practically ends our knowledge of the loader in longwall, but looking to its obvious advantages it

is certain that continued efforts will be made along this line to produce and modify a machine suited for this work. Underground loading by machinery constitutes the one large field for mechanical operation as yet practically untouched.

### Conclusion

Altogether there can be no doubt but that long-wall machine mining will be in the immediate future the greatest factor towards efficiency in underground operations. It offers to managers and owners a dream in the way of decreased costs and ease of production, worth years of experiment and trial. Beyond that statement it is hardly possible to proceed since to each district alone must be left the working out of the lines that will lead to success in the methods indicated in this article.

### SMELTING FURNACE FOR CYANIDE PRECIPITATE.

Mr. P. S. Anderson, of Baker, Oregon, in a paper presented at the meeting of the Columbia local section of the American Institute of Mining Engineers, held at the State College of Washington, Pullman, Washington, on May 16, said that his notes were submitted in the belief that they would prove of interest to operators of small cyanide plants where the installation of more expensive tilting furnaces is not practical. The furnace was described as being well adapted to the Taverner lead-smelting process, which Mr. Anderson had used for years with good results. The last furnace was used for nearly four years. It was built in a car-body, dimensions 24 x 42, in., and the brick-work had to be replaced about every twelve months.

Mr. Anderson's notes briefly described construction and operation. As to the latter the furnace is charged with about 100 lb. of cyanide precipitate, litharge and flux, approximately 70 lb. of damp precipitate being used. As this melts down more is added with a scoop shovel until there is about 7 in. of molten material in the furnace. After stirring, and when slag is fluid, the first tapping of slag is taken off, if necessary; otherwise scrap material—old cupels, speiss, etc.—is fed in, and fusion completed. In tapping, about two-thirds of the slag is taken off into the mould and the remainder of the charge is heated until the cupel, on testing with rod, feels smooth, when the entire remainder of the charge is poured by the tilting furnace into another mould. After cooling, slag and speiss is removed and lead bar is placed in the furnace for cupellation.

Although lead is allowed to go to waste, there is a compensating advantage in the fact that slag and bullion are cleaner. Very little gold is found in the flue-dust, although there is considerable silver. Samples give average results of 12.10 oz. gold and 11.40 oz. silver per ton. Slags assay, on an average, two cents per lb. in gold and silver, or \$40 to the ton. Gasoline consumption averages one gallon per 18 lb. of precipitate, this including cupellation and resmelting.

A number of employees of the Westinghouse Electric and Manufacturing Company, and the Westinghouse Machine Company went on a strike last month, because the management refused to recognize the demands made by the newly formed labor union, the Allegheny Congenial Industrial Union, and as a result the works of these companies at East Pittsburgh are partly shut down. The management of the companies does not believe that the trouble will be of long duration.



## OPENING A COAL MINE IN NOVA SCOTIA\*

By C. M. Odell.

While but little that is new to members of the society may appear in this paper, the writer's excuse for inflicting it upon the readers of the transactions is that a new generation, which is growing up, may be interested to know of the initial proceedings in opening what is destined to become in the near future one of the largest producing coal centres on the continent.

Before proceeding with the description of the initial work of opening and developing a coal basin it may be well to refer briefly to the field of which the Lingan Basin forms an important part, and to the early operations carried on therein.

The coal fields of Cape Breton, situated on the north-east coast of the island, are largely submarine, and are divided into four basins known locally as the Morien, Glace Bay, Lingan, and Sydney Mines basin, each of these being separated from its neighbor on the land areas by a well-defined anticline. Whether all these basins join into one great one far out at sea, or end as separate individual basins, must be left for future workers to determine, as it is not the purpose of this paper to enter into a discussion on that point. Historical records show that the value of these coal beds was known and some coal exported during the French occupation in the first decades of the eighteenth century.

The earliest mining operations were carried on by driving tunnels into the seams where exposed in the cliffs along the sea coast, or in gullies where the age-long action of streams had cut through the various strata, leaving them exposed on either side. Coal extracted at this time was generally loaded on scows which were towed out to waiting vessels anchored off shore and then transferred to the vessel's hold. In the early sixties of the past century a number of small companies were formed and operations commenced at a number of different points.

The system pursued by the small individual operators of these mines was to select a point as near the sea coast as practicable. There a mine was opened either by shaft or slope as the natural conditions best lent themselves thereto, and on account of the proximity of the shipping pier the coal was conveyed to the point of shipment direct in the mine tub or car in which it was loaded in the mine. The distance in most cases being less than a mile the transportation was effected by horses. Gradually the mining was extended and with increased shipments sinkings were made further back from the coast, machinery for handling coal in larger quantities was installed, short lines of steam railway were built, and the coal at the pit mouth was transferred from the mine tub to larger railway cars and thus carried to a point of shipment. It may be of interest to note the gradual expansion in size of cars used in hauling coal from the mines. Up to the early eighties the four-ton car or wagon was almost universal in Cape Breton. During the next few years cars carrying six tons each were introduced. These in turn gave place to ten-ton cars, which were the standard of the larger collieries only, up to the advent of the Dominion Coal Co. in 1893, when cars carrying fifteen tons each were substituted. These in turn are gradually giving way to steel cars with a carrying capacity of thirty-five tons dead weight of coal. In the same way, the little ten-ton schooner or "hooker" has

by successive stages been supplanted by the great ocean freighter of ten thousand tons carrying capacity.

The Dominion Coal Co. controls by lease from the Nova Scotia Government all the coal areas worth considering on the southern side of Sydney Harbor, but has for some years confined its operations to the Glace Bay basin. A royalty of twelve and one-half cents per ton is paid on all coal marketed, and this forms the greater part of the revenue of the province of Nova Scotia. A steadily increasing market has demanded a larger supply, and the company has now turned its attention to the immense reserve fields of Lingan and Morien basins. Both of these areas were worked to a certain extent some years ago. The Morien basin by two companies—the Block House and the Gowrie—while the Lingan basin was opened at three points by the Low Point, Barrasois and Lingan Mining Co.

The Block House Co., with openings close to the shore, shipped direct from mine tubs to the vessel's hold, over a small shipping pier in Morien bay, while the Gowrie Co. sank a shaft about a mile and a half inland, which was connected with a shipping pier by railway. Coal from the Lingan basin was shipped partly in Sydney Harbor, which was reached by four miles of railway, and partly in Lingan basin, where small piers were erected and connected with the mines by a mile of railway.

All of these individual operations were absorbed by the Dominion Coal Co. at its formation in 1893, many of them having been closed down for years before this date, and their piers allowed to fall into decay. The policy pursued by the present operators has been to concentrate their energies on the Glace Bay basin for production, and to confine the shipping mainly to two points, viz.: Sydney and Louisburg harbors, where modern shipping piers capable of handling all the product have been erected. Two points of shipment were necessary for the reason that the magnificent harbor of Sydney, lying within fourteen miles of the mines and offering unsurpassed facilities for shipment, is frozen over during part of the year, while Louisburg harbor, some twenty-five miles distant in the opposite direction, is open the whole year round and furnishes an outlet when Sydney is closed. Another small shipping pier at Glace Bay harbor supplies the smaller vessels frequenting this port. This is maintained more as a convenience to such shipping as discharges cargo in Glace bay and could not at times make Sydney harbor in safety without taking in ballast.

**Shipments.**—The bulk of the output is shipped at Sydney, where the tonnage during summer months is such that the output is removed as fast as it is sent from the collieries. At Louisburg, which is utilized during winter months, the same regular supply of shipping cannot with certainty be counted on, and consequently a large storage pocket with belt conveyor system is resorted to. Any overplus of coal raised during winter months is stored in coal bank and removed again in summer when the St. Lawrence trade taxes every source of supply to the utmost.

**Railway construction.**—This involves amongst other expenditures the construction of a branch line of railway, connecting each new colliery with the main line, and a colliery railway yard near the pit mouth for the handling and sorting of the various grades of coal.

\*Read at a meeting of the Mining Section Can. Soc. C.E., January 8th 1914.



The expenditure necessary to place in full operation a colliery in virgin territory is in round numbers about \$750,000 per unit, and may be generally divided as follows:

	Per cent.	
Purchase of site .....	2	\$15,000
Prospecting and temporary work...	2	15,000
Railway construction .....	12	90,000
Permanent bankhead, colliery build- ings and operating machinery....	33	247,500
Lighting. . . . .	2	15,000
Water supply .....	5	37,500
Drainage and grading .....	2	15,000
Housing employees .....	22	165,000
Fire and life saving stations.....	2	15,000
Shipping facilities .....	7	52,500
Underground development including tracks, mine tubs, piping and mine machinery .....	11	82,500
	100	\$750,000

**The Coal Seams.**—The known coal seams of the Lingan Basin extend from Sydney Harbor on the north to Lingan Bay on the south, a distance of five miles, and extending some two miles inland, embracing an area of ten square miles of land area and about ten square miles of submarine.

The general dip is northeasterly and the angle of dip about 14 degrees in the centre of the basin, decreasing towards the south and increasing as the seams are followed northerly to where they disappear under the waters of Sydney Harbor, where the dip has increased sharply until an angle of 40 degrees has been maintained.

The plans of the company comprise the opening in the near future of eight collieries in this basin, four each on the Victoria and Lingan seams. Four of these, numbered 12, 14, 15 and 16, are now practically complete and producing to their estimated full capacity of 1,200 tons per day, while a fifth is in process of development. Plans are maturing for the opening of two more at the extreme southern limit, and a similar one on the extreme northern limit. This will exhaust the operations on the Victoria and Lingan seams, and leave future enlargement of production to the Barrasois seam, which is the uppermost of the series, and the Mullins seam, which is the lowest of this group and consequently the largest in superficial extent. When these last seams are opened up to their capacity five more mines will have been added to the operations in the Lingan Basin, making thirteen mines in all in an area of ten square miles.

**The system of working** is to locate the various openings along the outcrop of the seams at intervals of about a mile and a quarter apart. The deep or main slope is then driven on the dip of the seam and from this the levels are broken off at intervals of 500 to 600 ft. These levels will extend half a mile on either side of the slope, at which point a solid barrier of coal extending parallel to the slope will be left. The barriers will extend from the surface to the extreme working length of the collieries, and are designed to separate each mine from the neighboring workings, so that in case of flood or fire each mine can be treated as an independent unit of production, and a stoppage of one mine need not affect the adjoining operations. Only a basin of such marked regularity in slope and position of the various seams comprising it would lend itself to such a system of working, and in this

basin nature has left nothing to be desired. The coal collected from the various levels is drawn to the main slope, whence it is carried by a rope haulage system to the bankhead, there to be run over screens and picking belts into the railway cars for transportation to either of the railway terminals.

**Company Houses.**—Records show an average of about 2.4 tons of coal raised per man employed, and the house record shows about 2.4 working men housed per tenement. Hence a colliery of 1,200 tons daily production requires five hundred men, and they in turn require two hundred tenements. The old time "miners' rows" have been long since tabooed and to-day the company erects neat cottages which are let to the men at reasonable rates. The most suitable style of tenement seems to be a good class of double house, set on a large lot of land, and the grounds around many of the miners' houses to-day present a neat and attractive appearance. These houses are erected and owned by the company. Their cost at present date averages about \$1,500 to \$2,000 per double block, exclusive of land. As they occupy extra large lots and are built on wide streets, they average but four to an acre, hence about twenty-five acres of land per colliery is required for housing alone. Adding 125 acres for colliery buildings, railways, roads, pole lines, pipe lines, and drainage ditches, we find an average of about 150 acres per colliery required for surface rights, or about 2,000 acres for a layout such as is undertaken here.

The lands surrounding the houses are for the most part owned by the company, and are all laid out and the streets graded by the company's engineers. In quite a few cases the miners buy lands and build their own houses, and this custom will no doubt increase as the whole section becomes more settled. The company encourages the men to become their own landlords, and assists them pecuniarily in many cases.

**Railways.**—About two-and-one-half miles of standard gauge track is required for colliery yard at each bankhead, with an additional amount of branch line to reach the main railway, making an average of about five miles of track to be laid for each colliery opened. This track is all laid with 60-lb. rails, while the main line, which is subjected to heavier traffic, is laid with 80-lb. rails. All tracks are built in a most thorough and up-to-date manner, as nothing less would suffice for the enormous and ever-increasing traffic.

**Coal Washers.**—As development proceeds and output increases, larger expenditures become necessary for increased screening appliances and picking belts by which the various grades of coal are sorted and impurities removed. More recently a wash plant or coal washery was demanded through which the lower grades of coal are passed to more effectually remove sulphur and other objectionable materials. To this end the company has erected a large coal washer of the Baum type, claimed to be the best in the world, and capable of washing one hundred and twenty tons of coal per hour.

**Power.**—As a matter of economy the refuse from the picking belts and the slack coal from the screens is used under boilers for power raising. A great change has been effected in recent years by the introduction of electric power in place of steam, and the tendency now is to eliminate all steam around the collieries of the Lingan Basin, except for heating pur-



poses. Up to this year these collieries have been supplied with electric power from a generating station located in the centre of the Glace Bay Basin, some eight miles distant, but as a part of the equipment a larger generating station situated in the heart of the Lingan district is now nearing completion. This station is to be operated by turbine-driven generators of from 2,000 to 4,000 kilowatt capacity. The boiler plant consists of three Bettington boilers, a description of which was published in the special Nova Scotia edition of the Canadian Mining Journal, published in September, 1912. When completed the entire equipment of this district, including air compressors, coal hoists, ventilating fans, bankhead machinery, screening plant and underground pumps will all be electrically operated.

**Rescue Apparatus.**—In the matter of protection both for men and property underground, the Draeger apparatus has been adopted, and the erection of a life-saving station at each mining centre is deemed a necessary portion of the general equipment.

**Water supply** is always one of the very first requisites, and at present a temporary pumping plant at Waterford Lake supplies the needs of the community through a main and distributing system. Plans are, however, about perfected for a full and ample supply to the whole community at an estimated cost of \$250,000.00.

**Lighting, etc.**—Surface workings of all collieries are electrically lighted from the company's plant, and some street lighting is also done. At present the town-site known as New Waterford, is unincorporated and practically all street work, drainage and sewerage is undertaken by the company. Mine drainage is effected by pumping plants located near the seashore, water being forced through vertical boreholes by electrically driven underground pumps, and carried by surface ditches direct to the sea.

**Transportation.**—Shipping piers with all modern appliances are located in Louisburg and Sydney harbors, the average haul from pit mouth to shipping pier being about twenty miles. Locomotives of 120 tons weight, with coal hoppers of two different types, are used on all lines, the two types being wooden hoppers of 15 tons capacity, and steel hoppers of 35 tons capacity. In addition a small percentage of coal which is shipped by rail is carried in box cars. To accommodate these, special box car loaders are installed at some of the collieries, as the loading appliances for hopper cars would not answer for the side doors of the box cars. Present pier loading capacity is about 1,600 tons per hour, but the new pier, which is nearing completion, will greatly increase this.

Coal carrying steamers have been gradually increased in capacity from the 3,000 ton ship, which was looked upon as a leviathan some twenty years ago, to vessels of 10,000 tons capacity in use to-day. These will again be displaced by ships of still greater burden as years go by.

**Additional expenditures for equipment.**—Even with the colliery fully equipped and producing to its full capacity, expenditure on capital account cannot be said to have ceased entirely, as with the working extending farther and farther to the deep, increased pumping and ventilating capacity becomes necessary, the increased length of mine tracks and air piping add their quota, and additional mine cars and mining machines are required to gather a given quantity of coal over a greater area.

## WHEATON DISTRICT, YUKON.

The Geological Survey has issued a memoir, No. 31, on the Wheaton District, by Mr. D. D. Cairnes. The report is accompanied by a geological and a topographical map. Mr. Cairnes gives much useful information concerning the district, its character, general geology and economic geology.

From the standpoint of economic geology, Wheaton district is chiefly of interest for its ore-deposits, but, in addition, some coal-seams have been discovered. The ore-deposits may be considered as belonging to four classes: (1) Gold-silver quartz veins. (2) Antimony-silver veins. (3) Silver-lead veins. (4) Contact-metamorphic deposits.

The gold-silver veins are the most extensive, and are of particular interest in that they contain not only native gold, but various tellurides. The gold content of these ores is generally of considerably greater value than the silver. The antimony-silver veins belong to a rare type of deposit, in that they are antimony deposits the ores of which contain both antimony and silver in economically important amounts. Such deposits are known in only a few localities in the world, and have been named in Germany the 'Mobendorf type.' The silver-lead veins contain silver and lead in important amounts, and are mainly metasomatic replacement deposits. They thus differ considerably from the two types of veins just mentioned, which are prevailingly cavity-fillings. The contact-metamorphic deposits have been discovered on only one claim, but are noteworthy since, although the mineral-combination, the form of occurrence, etc., are those usually encountered in such deposits, the formation in which the ore-materials occur is a calcareous hornblende-gneiss. Limestone is the usual rock in which such secondary ore-materials are produced, and occurrences in quartzite and shales are known, but the occurrence of contact-metamorphic deposits in a gneiss of purely igneous origin is believed to be something new in the history of ore-deposits. Economically the ores are of interest, mainly on account of the copper they contain.

Seams of semi-anthracite coal, from a few inches to several feet in thickness, were discovered by the writer on the eastern face of Mt. Bush; these have not been at all developed so far, but should prove of local value.

Few of the mineral deposits have been at all closely prospected, so that little is really known concerning the mining properties of this district; and the area, as a whole, has been only very superficially looked over by a few men, so that it is improbable that all the better deposits of ore have yet been discovered.

## CALIFORNIA OIL.

With the exception of a negligible quantity of oil carrying some paraffine, all of the oil from the California fields has an asphalt base. About 40 per cent. is what is commonly known as heavy or fuel oil, while about 60 per cent. is passed through stills for topping or refining, the residuum being used as fuel. The bulk of the production is, therefore, used for fuel or road dressing, either in its crude state or as residuum. Most of it is utilized in the Pacific States and Canada, but some is exported to the adjacent States to the east, and to Hawaii, Japan, Alaska, Panama, and South America. The output of California in 1913 was valued at \$43,500,000.



## 195 LIVES LOST AT HILLCREST MINE

Calgary, June 20.—Of the 236 men who entered the Hillcrest mine at 7.00 a.m. yesterday only 41 have come out alive. Sixty dead bodies have been recovered, and



A view from Hillcrest towards Crowsnest Pass. Turtle Mt. at left. White rock in middle distance is part of Frank landslide.

135 are still missing. This is the content of the latest official statement issued by Mr. Brown, the general manager of the mine at Hillcrest. Experienced miners at the scene of the disaster state that, considering the violence of the explosion, it is impossible that any of

felt in the south workings, where over one hundred miners are now entombed, and believed to be dead. Of the 50 workers who entered the north workings, all but nine were taken out alive.

The force of the explosion was so terrific that both the north and south entrances of the mine, two miles away from the occurrence, together with the roof of the engine house outside the south entrance were shattered.

No official statement has been given out as to the cause of the explosion, but the survivors attribute it to the presence of fire damp in the old workings.

This disaster is the worst which has ever occurred in the history of the Canadian mining industry, wiping out as it did, practically the whole male population of Hillcrest. It is the first catastrophe of its kind which has occurred in this particular mine, but four years ago a similar incident occurred at Bellevue mine, about half a mile from this point, resulting in the loss of thirty-three workers.

The rescue work, which was commenced immediately after the explosion, has been pushed forward as fast as possible, and is still going on. However, the progress of this work is necessarily slow, as it is thought that fire is raging in the interior of the mine, and there is fear of another explosion.

Rescue trains were rushed to Hillcrest shortly after the explosion from Lethbridge and Fernie, and six gangs were immediately set to work at clearing away the tons of earth and stone which are blocking the entrance to the mine. Forty bodies were recovered within two hours, and it is estimated that it will take at least a week before the huge mass of debris can be removed and all of the remaining bodies recovered.

The following statement has been issued by J. M. Mackie, managing director of the Hillcrest Collieries, Limited, regarding the accident:—

"We received a wire yesterday advising us of an explosion in the mine and stating the extent of the damage is unknown at present. We have 377 men on our pay-roll, including office help and outside labor. It is probable that 250 men were in the mine at the time of the explosion. A wire received at the C.P.R.



Hillcrest station on the C.P.R., Alberta. Geologists returning from visit to Hillcrest Mine, August, 1913.

the 135 who have not yet been recovered are still alive. This leaves the number of known dead at 195.

The mine is divided into the north workings and the south workings. The full force of the explosion was

offices here states that 65 men have been taken out alive, but at this writing we have no direct report. Our men are doubtless too busy at rescue work to communicate with us.



"In planning our mine we constructed two distinct entries about half a mile apart which are connected underground and great precaution has always been taken in the ventilating of the mine. Our engineer's weekly report just received states ventilation good in all parts. We are at an utter loss to understand how such a tremendous catastrophe could have occurred."

Later in the evening, Mr. Mackie received a wire as follows: "The explosion was in No. 1 mine. This is the mine where most of the men were at work, No. 2 mine is where our new development is going on. Two hundred and thirty-two men went into the mine this morning at 7 o'clock. The explosion occurred at 9.30 o'clock. At 4 o'clock in the afternoon thirty men had been taken out alive and 32 dead bodies recovered.



Tipple, Hillcrest Mine, Alberta.

The missing at present number 170. The work of rescue is progressing steadily and artificial respiration constantly and vigorously applied to those brought up. Excellent order prevails and the best of equipment is available for rescue work."

J. M. Mackie said that the accident to him was a mystery in the absence of more detailed information, for the development work in the mine had been carried out with the idea of giving the maximum of safety. In addition to the two main outlets there was some eight others which were of easy access at the chief points in the workings.

Hillcrest, Alta., June 22.—While rescue work is still being kept up in the Hillcrest mine, it is not with any hope of finding any more men alive, but in the effort to secure the remains of the victims, so that they may be given decent burial.

While men, haggard with lack of sleep and dull eyed from unremitting toil, still dig away the debris in the hope of finding the bodies of all who were entrapped, a

community of widows and orphans form funeral processions to the cemetery on the mountain slope. All day yesterday and to-day these tragic little groups have been trudging through the town out to the burying ground. Friends returning from the burial of some member of the family stand aside while the cortege of a neighbor wends slowly by and fall in behind offering such poor comfort as their stunned minds and ravaged hearts can suggest.

In one short street alone, consisting of barely thirty houses, crepe hangs on thirteen doors, and within thirteen widows try in vain to hush the sobbing sorrow of their orphaned children.

Sad as are those who have buried their dead, there is a more tragic group gathered around the mouth of the pit waiting, so far in vain, for the bodies of those who have not yet been recovered. The condition of some of the bodies, torn and shattered by the explosion, has made identification impossible, but still this little group watches, leaving their points of vantage neither to sleep nor eat.

In the face of the stunning effect of the disaster the quick thinking and rapid action of General Manager Brown, who at the moment of hearing of the explosion, reversed the fan which supplied fresh air to shaft, has not been forgotten. Forty-eight miners dashing for the opening and about overcome by the noxious fumes, were refreshed by the draught of fresh air, as the fan began to spin, and those about to drop in their tracks made another effort and escaped.

Manager Brown reported to-day that 181 bodies had been recovered. 48 men were taken out alive, 8 are still unaccounted for.

#### DOMINION STEEL CO. HAS BIG ORDER.

In reply to a telegram asking for information with regard to the receipt of orders for rails from the Canadian Northern by the Steel Company, President Plummer said to your correspondent: "Yes, we have received a large order from the C. N. R., and our mills are at the moment rolling the rails. No matter how many orders we receive we could not work the plant at any higher pressure than at present. The works will be kept going night and day for the rest of the year."

Your correspondent has it from excellent authority that the Steel Company has a total of seventy thousand tons of 80-lb. rails to roll, before they can go back to work on the South African and Australian orders. Mr. Hawthorne, a Pittsburg expert who visited the plant to-day, said: "The class of rails produced at the Sydney plant of the Dominion Iron and Steel Company are second to none on this continent, and it can be assumed from the fact that orders are received from England, South Africa and the Antipodes, that the rails turned out here are at least equal to, if not better than, those made in Great Britain.

"The immense plant is particularly well equipped for the speedy and efficient output of rails and has a milling capacity of something approaching one thousand tons a day, if necessary. The efficiency system of inspection of all products observed by the corporation's own inspectors besides those on the spot on behalf of the buyers of the materials as they are turned out by the mills, leaves nothing to be desired in the matter of taking precautions against any possibility of material passing out with faults or flaws which might form by any chance in process of manufacturing."

The mills have been working since Monday morning on the C. N. R. order and the first consignment will be ready for shipment by Thursday. It will go by water. —Journal of Commerce.



## CANADIAN MINING INSTITUTE— WESTERN BRANCH

The eighteenth general meeting of the Western Branch of The Canadian Mining Institute was held in Nelson, British Columbia, on May 28. Mr. Samuel S. Fowler, general manager for the New Canadian Metal Co., Ltd., presided, and there was a satisfactory attendance of members and visitors at all three sessions morning, afternoon, and evening.

After the chairman had declared the morning session open and had remarked on the benefit such meetings are to those engaged in mining, he recalled that nearly 12 years ago—in September, 1902, he had presided over a similar meeting in Nelson. There was at that time, perhaps, just as much business done, but the feeling of fellowship between mining men now apparent was at that time lacking. The Western Branch of the Institute, organized at Nelson in January, 1908, had done much toward developing the good feeling he had just mentioned, and this truly had been a benefit to all concerned. In addition, the branch had encouraged the contribution of papers, many of which had been of much value.

After the visitors had been welcomed by the Mayor of Nelson and Mr. W. R. Maclean, member for the district in the Legislative Assembly of the province, Mr. Fred A. Starkey, president of the Associated Boards of Trade of Eastern British Columbia, spoke on the importance of the mining industry to Kootenay district and the province as a whole.

On invitation, Prof. Arthur Lakes, addressed the meeting, and in the course of his remarks mentioned that he had been much impressed by the magnitude of some of the mineral veins occurring in British Columbia. He had heard doubt expressed as to whether the ore in such veins "goes down," but, judging by the experience in other countries, it is incredible that it does not. He had confidence that it would be found on development that the ore does continue to great depth. Many of the veins occur in the throat of an ancient volcano, which no doubt goes down to a tolerable depth, so there is no reason to think these veins peter out within the limit of present-day mining. There are other factors in British Columbia of importance to the mining industry, such as the unsurpassed water powers of the province and its magnificent timber. Then there are, for the future, large alluvial deposits suitable for dredging for gold.

The chairman called attention to the fact that, that day in New York, the Columbia School of Mines, of which he was proud to be a graduate, was celebrating the 50th anniversary of its founding. The quality of the work of that institution had not been the result of wealth nor equipment, but rather of the braininess and manhood of the instructors, especially the early ones, and of the braininess of the students they instructed. There are now many other good schools of mining, but all had received benefit from the early efforts of the Columbia instructors, whose graduates had spread all over the country. He could recall the names of many famous men, known by their good work, who were Columbia graduates. Most of those men had come West. The great changes that had taken place during the 30 years since he had graduated were briefly reviewed by Mr. Fowler, who contrasted the many advantages enjoyed by mining men to-day with the few of the earlier period of which he spoke. These changes, though, had

led to more and better work in a technical way. Probably the average man around a mine, mill, or smelter to-day does two or three times as much as was accomplished 30 years ago, on account of improved conditions and facilities. Reverting to the Columbia school of mines, Mr. Fowler expressed the opinion that all would recognize the benefits that had resulted from founding the first school of mines in America. Prior to 50 years ago students had to go to European universities, but the training in those institutions was simply a foundation, for students in them were not taught in a manner adapting them for the practical work they had to do in America. A graduate from a European school of mines seldom could carry out the practical work of laboratory or mine. All praise, therefore, should be given to Columbia, and other technical schools since established for the good work they had done and are still doing.

At the suggestion of the branch secretary (E. Jacobs) a resolution was adopted requesting Mr. Fowler to telegraph to the Columbia School of Mines the congratulations of the meeting there assembled. In proposing this resolution, Mr. L. B. Reynolds, M. E., said that his grandfather is the oldest living graduate of Columbia. He was a graduate of the medical faculty of that university in 1842; he is 94 years old and is still practising medicine.

The morning session was closed after Mr. Dudley Michael, first aid instructor of the Provincial Department of Mines, had given a demonstration of the use of a Draeger pulmotor.

The afternoon session was occupied in reading and discussing several papers as under:

"Suggestions for Organization and Conduct of Safety Work in Metal Mines," by Mr. Edwin Higgins, mining engineer, U. S. Bureau of Mines, Washington, D.C.

"The China-clay Deposits of Cornwall, England," by Prof. Arthur Lakes, Denver, Colorado.

"Notes on the Costs and Results of Operations at the Motherlode Mill, Sheep Creek, B. C.," by Mr. W. P. Alderson, general manager Motherlode Sheep Creek Mining Co.

A paper on "The Copper Deposits of East Kootenay, B. C.," by Mr. Stuart J. Schofield, Geological Survey of Canada, Ottawa, was read by title only. Mr. Schofield not having arrived from the East until the evening, Dudley Michael outlined the course he intends to follow in giving first aid instruction. Several of the mine managers present promised their hearty cooperation in this work.

The evening session was opened by a demonstration of the use of the pulmotor. Afterward, the secretary read a contribution by Mr. A. D. Wheeler, of Ainsworth, Kootenay lake, entitled "The Story of Early Kootenay." Following this, the chairman expressed the hope that more of the old-timers would commit to writing their knowledge of the early days. Accurate history is composed largely of an aggregation of many details of personal experiences, the knowledge of which too often died with the men and thus were lost.

An article entitled "The Radium Rage," compiled by Mr. F. A. Ross, consulting engineer, Spokane, Wash., illustrated by lantern-slides of radiographs, was read, and proved of much interest.

Mr. Fowler thanked the members for having elected him chairman of the branch for the ensuing year, and the proceedings then terminated.



## GRANBY

Mr. Jay P. Graves, formerly general manager of the Granby Consolidated Smelting and Power Co., Lim-



**Granby's Knobhill-Ironside Mine, Phoenix, B.C.**

ited, has sent the following statement to the Journal of Commerce:

"I tendered my resignation as general manager of the Granby Co., taking effect last October, and F. M.

Sylvester, who has been my assistant for about two and one-half years, was elected to fill that position.

"My reason for making the change was that I had been general manager for about 18 years, having organized the original companies in October, 1895, and had full management of the properties, both in securing the mining properties, in their development and equipment, in the construction of the smelting plants, and their operation, as well as the financing of these companies over this period of time.

"I felt, about four years ago, that I should be relieved of the work, and asked that it be done at that time; but, owing to our considering entering a new field, namely, the Pacific coast, so as to extend our operations, it was deemed inadvisable that my resignation be accepted at that time. So far as I know, that is the only reason connected with the change made, and it was at my solicitation.

"The Granby's mines at Phoenix have very large ore deposits, and development of large ore reserves was made during its early career, and they have gradually depleted ever since the starting of the old smelting plant at Grand Forks, and at the end of each year we have had less ore in sight than the previous year, because of the large tonnage extracted, and it has not been anything new to the eastern directors that this has taken place. If it was new to them, it was because they didn't understand the business with which they were connected.

"The Granby Co. owns a large area of property at Phoenix, nearly four miles in length, and about one mile in width at its widest. Only a small proportion of this area has been prospected. How much additional ore exists in this ground is, of course, not known. This additional ground has been purchased by the company over a period of years, under my direction, believing that it contained ore; and, as the property was purchased at low prices, it was considered to be good business, and a gamble well worth taking.

"We have each year explored a certain amount of the area, some years putting in sight nearly as much ore as we extracted, and other years not any, until the development upon the Hidden Creek mines was undertaken. At that time, it was found that the earnings from the mines at Phoenix were not large enough to



**Victoria shaft terminals on C.P. and G.N. Railways—Granby Consolidated, Phoenix, B.C.**  
Over 10,000,000 tons of ore have been shipped from the Granby Mines at Phoenix.



continue our dividends, and to explore further the properties at Phoenix, and also to carry on the exploration work and development upon the new mines at Hidden Creek.

"As the new mines at Hidden Creek showed better grade of ore than at Phoenix, it was deemed good business and more profitable to the company to use all the earnings of the plant at Grand Forks, outside of dividends, for exploration and development at Hidden Creek.

"I think the correctness of this view has been demonstrated by the large tonnage of better grade ore that has been put in sight at Hidden Creek since starting the new smelting plant at Hidden Creek, the ore there being about 21-2 per cent. copper, recovering over 40 lb. since its commencement. The Grand Forks plant the past year has recovered between 17 and 18 lb., and that has been about the recovery over a period of two or three years, and not over 20 lb. for several years past.

"We now have a large tonnage of better grade ore in sight at Hidden Creek; hence, more money has been made for the stockholders.

"It was our policy, and probably will be carried out, that as soon as the Hidden Creek smelter was in operation, and the increased earnings were had, we would then have sufficient funds from the earnings of the two plants not only to increase our dividend rate, but to further explore the ore bodies and the land we own at Phoenix, and this undoubtedly will be done.

"I still retain the same interest in the company that I have had for a period of years, and have the same interest in the property and its future. I am going to Hidden Creek in the next two weeks, to go over the property with Mr. Sylvester. Everything is working nicely at both plants. I am pleased to say that both the mining and smelting costs are less than we calculated, so that to-day the future of the properties seems very bright, and the stockholders can be congratulated on the prospects."

### DOMES.

Timmins, June 18.—as a token of the high esteem in which he was held by the members of the staff at the Dome Mining Company. Mr. H. C. Meek, general superintendent, was tendered a farewell banquet and dance on Wednesday evening.

The event took place at the Dome itself, and a large number of friends and admirers from the neighboring towns of Golden City, Schumacher and Timmins, dropped into South Porcupine to see the ever popular superintendent once more before he made his departure.

The farewell banquet was a most decided success, and after the tables had been cleared, dancing was indulged in until early in the morning. As a last and fond reminder, Mr. Meek was presented with a lovely chest of silver on the part of the staff, who appreciate considerably the benevolent, assiduous and enterprising characteristics which have always prevailed in the various undertakings in which Mr. Meek has taken part.

Prior to coming to Porcupine some four years ago, Mr. Meek was superintendent at Crean Hill, one of the many properties of the Canadian Copper Co. Ltd., at Copper Cliff. Mr. Meek attained this position by sheer hard work. He was previously engaged on the engineering staff and gradually worked his way up. At the time of his arrival in Porcupine, the Dome property

was in its infancy, and now after considerable hardships it ranks amongst the foremost mines in the country.

Those who were in the camp at the time of the great fire, will remember the narrow escape Mr. Meek and his family had from being burnt to death. It was due to the timely presence of mind and courage of one of the employees that the whole party was saved. Mr. Meek came from Mandan, Michigan, and is now about to undertake a trip through the West, whilst his wife and family will go to California.

All those who have come into contact with Mr. Meek, either in his official capacity or on the street, will regret his departure from the camp and he leaves with the good will of the whole district. Mr. Meek left South Porcupine on the early train on Thursday morning.—Cobalt Nugget.

### MOND NICKEL CO.

The directors of the Mond Nickel Company, Limited report that the progress of the company's business during the last financial year has been of a very satisfactory character, and they estimate that the profits made during the year will show an increase over those of the previous year of about £650 000. They expect to be able to place the balance-sheet and accounts before the shareholders as usual during the month of June.

During the course of the last financial year the directors have acquired for the company, on very favorable terms, a number of new mining properties in the Sudbury district, Ontario, Canada, comprising together about 3,200 acres. These include the Worthington and Bleazard mines and other mining lands of the Dominion Mineral Co., and also the Levack properties. At Levack No. 1 mine the existence of a large body of nickel-copper ore of excellent grade has been proved by diamond drilling, which circumstance in itself considerably increases the company's ore reserves and assures an ample supply of ore, even at an increased rate of production, for many years.

Having regard to the present position of the company's resources, the directors have decided to recommend a reorganization of the company's nominal capital in order to make the same more nearly equivalent to the real value of its assets, as, in the opinion of the directors, the mining properties of the company in the Sudbury district have been proved to be of much greater value than the figures at which they appear in the books of the company. The directors recommend to the shareholders the adoption of a reconstruction scheme. This scheme has the advantage of abolishing the deferred shares, the holders of which exchange these for ordinary shares, so that the new company's capital will only consist of cumulative and non-cumulative preference and ordinary shares.

### BAILEY-COBALT.

Bailey-Cobalt Mines, Limited, a company incorporated under The Ontario Companies Act, having its head office at the City of Windsor, in the Province of Ontario, and carrying on mining operations in the Township of Coleman, District of Nipissing, has made an assignment under the Assignments and Preferences Act of its assets, credits and effects to The Trust & Guarantee Company, Limited, 43-45 King Street West, Toronto, for the general benefit of its creditors.



# ORE DEPOSITS OF ATLIN DISTRICT\*

By D. D. Cairnes.

Atlin mining district is situated in the northwestern corner of British Columbia north latitudes 59° and 60° (the British Columbia-Yukon boundary), and extends from longitude 132° to 134° 30' west of Greenwich.

**Placer-gold.**—Atlin became known as a productive placer-gold camp early in the year 1898, and since then a number of creeks on the east side of Atlin lake, within a radius of 15 or 20 miles from the town of Atlin, have made this one of the more important gold-producing centres in Canada. A number of quartz claims, also, were located during the summer of 1899 and properties of this type have been developed more or less from time to time, and, although the attention and efforts of most persons interested in mining in this district have been mainly directed to the placer deposits, yet a few prospectors and mining-men have continued to prospect for, and develop the non-placer ore deposits, and have succeeded in maintaining a certain amount of interest and hope and even, at times, enthusiasm, concerning lode mining in this district.

Since about 1905 greater attention has been given to the lode-mining industry, partly on account of the promising character of some of the more recent discoveries on Taku arm and also because the Atlin placer deposits are known to be slowly becoming exhausted, and those interested in the welfare of the district are watching more keenly than formerly the development of lode-deposits with the hope that they may continue to foster the mining industry when the gravels no longer are profitably exploitable. In 1899 Prof. J. C. Gwillim reported on Atlin district for the Geological Survey of Canada, and a reconnaissance topographical and geological map accompanies his report. Since the years 1899 and 1900, when the field-work for this report and map was performed, conditions pertaining to placer mining have not materially altered; the geology of the gravels too is fairly well understood, but development has been more rapid in the case of the other mineral deposits of the district.

**Accessibility and Transportation.**—A rail and steamboat service connects Atlin with the Pacific coast at Skagway. Commodious steamers make regular trips throughout the year between Seattle and Skagway, Alaska, and also between Vancouver and Skagway, distances of 1,000 and 867 miles, respectively. From Skagway the White Pass and Yukon railway has been constructed to Whitehorse, Yukon, a distance of 111 miles. From Caribou, a point on the railway 61 miles from Skagway, a steamer makes two trips a week to Taku Landing, which is about 70 miles from Caribou and is situated at the eastern end of Graham inlet, an arm of Taku arm. A railway 2 miles long extends from Taku Landing to a point on the western shore of Atlin lake, whence a steamer connects with the town of Atlin on the eastern shore about 5 miles distant. All points on Atlin lake and Taku arm are thus directly connected by rail and steamboat service with Skagway.

Wagon-roads have been constructed from Atlin up Pine and Spruce creeks and their more important tributaries, also up Fourth-of-July creek. Roads or trails have been made up Pike river, McKee creek, and other important streams on the east side of Atlin lake. A wagon-road has also been built from Kirtland on the west side of Taku arm to the lode-discoveries on

Bighorn creek, and roads have been constructed connecting the workings at the Engineer mines and Gleaner group with the east shore of Taku arm.

During the winter season a stage runs regularly between Carcross and Atlin—a great part of the journey being made on the ice; in the late and early winter, just before navigation is open and after it closes, while the ice is uncertain, dog-teams carry the mail between these points.

**Mineral Deposits.**—Atlin mining district possesses quite a variety of economically valuable minerals which occur in places in deposits of considerable size. In some of the mineral veins, pockets of exceptionally rich gold ore have been found. Practically all the deposits are readily accessible. The lode-mining industry in the district has made a good beginning and will probably continue to develop in the future. The results up to the present are particularly encouraging when it is remembered that since 1898, when mining commenced in the district, nearly all persons engaged in this industry have devoted practically all their attention to the gold-bearing gravels, and that, until very recently, there has been a relatively slight amount of prospecting for quartz.

**Gold-tellurium veins** have been found only at the Engineer mines and on adjoining claims which are situated on the west side of Taku arm above Golden Gate, and much the richest ore discovered in Atlin district has been obtained from these properties. The finding at the Engineer mines of pockets of quartz worth from \$3 to \$5 per pound, caused considerable excitement during the summer of 1910, and has had a decided effect in arousing enthusiasm in quartz-mining.

**The gold-silver veins** are the most wide-spread type of deposits, and are found in a number of localities distributed over the greater part of the district.

**Cupriferous silver-gold veins** have been found on Table mountain, where, however, only one deposit of any promise has been discovered.

**Silver-lead veins.**—A number of strong, well-mineralized veins belonging to the silver-lead division, occur on Crater creek and in that vicinity.

**Copper veins** have been found on the southern end of Copper island, but those so far discovered do not appear to be of present, economic importance.

**One antimony vein** is known to occur in the district; it outcrops on the west shore of Taku arm 10 miles below Golden Gate, but as the deposit has been exposed for only about 15 feet, very little is known concerning it.

**Contact-metamorphic deposits**, so far as is known, occur only on Hoboe creek near the upper end of Torres channel. These possibly should all be considered as belonging to a single ore body since they are situated along the same geological contact, and it seems probable that the ore persists between the points where it outcrops or has been encountered. The ore-material consists largely of magnetite carrying varying amounts of copper, and wherever it has been exposed exceeds 30 ft., and is at one point 150 ft. in thickness. Outcrops have been discovered throughout a distance of at least 3,000 ft.

**Coal.**—No coal seams have been found in the area, but the Tantalus conglomerate, which is always associated with coals in southern Yukon, occurs at sev-

\*Extracts from Memoir No. 37, published by Geological Survey Branch, Department of Mines, Canada.



eral points. Also a considerable amount of float coal has been found to the northeast of the lower end of Sloko lake, and there is every likelihood that the seams from which this is derived will yet be found.

**Gold-tellurium Veins.**—Gold-tellurium quartz veins have been discovered in Atlin district in only one locality which is situated on the east side of Taku arm above Golden Gate. The greater number of the veins occur at the Engineer mines where the bulk of the rich ore in this type of deposits has been found. Veins containing pockets of good ore, however, have also been discovered on adjoining claims.

**The Engineer Mines.**—This property is situated on the east side of Taku arm about 10 miles above Golden Gate, and consists of eight connected claims, four of which extend to the water's edge, the other four adjoining these to the east. The group is owned by the Northern Partnership composed of Captain James Alexander, John Dunham, B. G. Nicol, and K. Wawrecka.

The Engineer mines were first located in 1899, and a joint stock company was formed, known as the Engineer Mining Co., who held the property until 1906. The claims are then believed to have lapsed, and were located by Edwin Brown and partners who held the property one year, when it was acquired by the present owners.

The ores at the Engineer mines occur in veins, mainly in Jura-Cretaceous shales and finely-textured greywackes, that vary from dark-greenish and brownish, to almost black in color. The veins range from simple veins a few inches in thickness, to compound veins over 200 ft. thick, and consist largely of quartz, calcite, and intercalated and brecciated wall-rock. The chief metallic mineral is native gold; in addition small particles of tellurides, as well as some pyrite and native antimony, also occur. The veins are thus of value only for their gold content.

It is not known even approximately what average amounts of gold the larger veins contain, but tests so far made have given results ranging from traces to about \$10 per ton. Pockets and shoots of remarkably rich ore occur in a number of the narrower veins that have thicknesses of from 6 in. to 4 ft., and it is these that have been mainly prospected and developed.

This group of claims is easily accessible, being situated on the shore of Taku arm, and thus directly connected by navigable water with Caribou on the White Pass and Yukon railway. The property is still in the uncertain, prospect stage, but possesses some promising features.

**The Gleaner Group.**—The Gleaner group consists of three claims and a fraction that lie to the east of and adjoin the Engineer mines. These claims were located in 1900, and in 1901 the owners formed a joint stock company, known as the Gleaner Mining and Milling Company, who still hold this property. This Company is capitalized at \$250,000, the president is Mr. David Stevens, the secretary-treasurer is Mr. P. F. Scharschmidt of Whitehorse, Y.T., and the board of directors include the above named officers and Mr. R. Butler of Atlin, B.C., Dr. Lindsay of Calgary, Mr. D. Von Cramer of Vancouver, Mr. M. H. McCabe of Victoria, and others.

**The Kirtland Group.**—The Kirtland group is owned by Thos. Kirtland and Captain W. Hawthorn, R.N., and consists of six claims that extend along the east shore of Taku arm from the Engineer group southward to 100 ft. or so across Hale creek, a distance of approximately 8,000 ft. The geological formation on

this property is the same as at the Engineer mines and on the Gleaner group, and the veins that have so far been discovered resemble those found on these properties. However, on the Kirtland group, only a slight amount of prospecting has as yet been performed and this has practically all been confined to the Jersey Lily claim which adjoins the Engineer group. Several simple quartz veins a few inches in thickness, and one brecciated vein 2 to 3 ft. thick have been discovered. Two shafts about 10 and 14 ft. deep respectively have been sunk and a few open-cuts and trenches have been dug.

Since this property adjoins the Engineer mines and the formation is apparently identical on the two properties, it is hoped that rich ores will also be discovered on the Kirtland group when the claims have become more thoroughly prospected. So far, only a slight amount of gold has been found.

### Gold-Silver Quartz Veins

**The White Moose Group.**—The White Moose group is situated on the west side of Taku arm opposite the Engineer mines and consists of eight claims which are owned by four persons, three of whom are Dr. H. S. Young, and Messrs. J. Johnson and Robt. Grant. Two veins, distinguished as the North and South veins respectively, have been discovered on this property. Five claims have been located in the valley-bottom along the strike of the North vein, and these extend southward along the shore the length of the five claims from a point about one-half mile above the mouth of Buchan creek. The other three claims have been located along the South vein which strikes in a northwesterly direction; and the most easterly of these claims extends to the shore of Taku arm and adjoins the most northerly of those located on the North vein.

**The Rupert Group.**—The Rupert group is owned by Messrs. Allan Rupert and James Johnson and consists of 8 claims located on the east face of Whitemoose mountain which is situated on the west side and near the upper (south) end of Taku arm. The property is thus on the lake-front very favorably situated for mining purposes.

**The Lawsan Group.**—The Lawsan group is owned by Fred Lawsan, Thos. Kirtland, Wm. Powell, Robt. Pelton, Dan Sullivan, and Agnew A. Lawsan, and consists of six claims located on the west side of the valley of Bighorn creek. This property was first staked in 1898, has since this time been owned by several parties, has lapsed twice, and was located by the present owners in 1909. The greater number of the veins that have been discovered are on the Bighorn claim where all the development work has been expended. The British Columbia government during the summer of 1910 constructed a wagon-road from Kirtland on Taku arm up the valley of Fantail river to Bighorn creek, and thence up the valley of this stream to the lower terminal of the aerial tramway on the Lawsan group, a distance of 10 miles, so this property is now readily accessible.

**Other Claims on Bighorn Creek.**—About 1 1/2 miles north of the Lawsan group, and also on the western slope of the Bighorn valley at a point about opposite Peter's cabin, a fissure-vein outcrops, which is traceable for a distance and is remarkably persistent in dip, strike, thickness, and mineralization. This vein cuts the schistose and gneissoid members of the Mt. Stevens group of rocks, has an average thickness of about 3 1/2 ft., strikes N. 56° E., and has an



almost perpendicular attitude. The fissure-filling consists almost entirely of quartz throughout which are occasional particles of pyrite. This vein is remarkable for its persistency and for the fact that it is the only fissure-vein noted in this locality. The quartz is believed to carry a few dollars per ton in gold, but none of the known assays so far obtained have given more than \$10 per ton in gold and silver.

At least two claims, the 'Birdie' and the 'Gold Cup,' owned respectively by Wm. Powell and Fred Lawsan, are located on this vein, and on the Gold Cup two tunnels 35 ft. and 160 ft. in length respectively, have been driven in on the quartz.

**The Imperial Mines.**—The Imperial mines are owned by Messrs. T. H. Jones, and James Stokes of Atlin, and William A. Moore of Nanaimo, B.C., and consist of four crown-granted claims situated on the south side of Munroe mountain, 5 miles in a northwesterly direction from the town of Atlin to where a good wagon-road has been constructed; the entrance to the lower tunnel is 1,030 ft. in elevation above Atlin wharf. This property was first located in 1899, and in 1900 was bonded to the Nimrod Syndicate of London, England, who surveyed and crown-granted the claims, built a five-stamp mill and bunk house on the property, and did considerable development. At the end of a year this syndicate abandoned the property and Mr. Herbert Pearce obtained an option on it for 2 years, 1901-2. Since this time no work has been performed on the property.

All the work at these mines has been expended in developing a single quartz lode which occurs in a finely-textured rock that ranges from a hornblende-diorite to a hornblende-diorite porphyrite. The lode strikes N. 70° E., and dips at angles of 50° to 60° to the southeast. This deposit includes two or three close, parallel, mineralized fissures which contain an aggregate thickness of 2 to 3 ft. of vein material consisting mainly of quartz, sparsely distributed through which are particles of galena, chalcopyrite, pyrite, malachite, and occasionally, native gold. A considerable portion of the quartz is thought to contain from \$10 to \$30 per ton in gold and silver, the silver relatively small in amount. Two cross-cut tunnels have been driven, which tapped the vein at 25 and 112 ft. respectively, and from these over 400 ft. of drifts have been driven.

Plenty of water is available at the base of Munroe mountain for crushing and milling requirements, and the falls on Pine creek nearby, would afford ample power for any ordinary mining requirements.

The property thus possesses many natural advantages and contains a considerable tonnage of ore which, although low grade, should prove profitably workable by modern economical methods.

**The Beavis Mine.**—The Beavis mine is owned by the Gold Group Mining Company, Limited, in which Messrs. H. Maluin and Wynn Johnson are the principal shareholders. This property consists of nine mineral claims three of which are crown-granted, and is situated on the east shore of Atlin lake 1½ miles north of the Atlin post-office.

Several thousand dollars have been expended in the development of these claims, mainly by two shafts which when visited in October 1910, were filled with water, so that no definite information could be obtained concerning their depths or the character of the ore deposit. From the material exposed on the dump, the rock in the shafts appears to be mainly black chert and chert breccia, but a granite-porphry dyke also cuts

the formation in this vicinity. The ore apparently consists of a quartz vein carrying some pyrite and free gold.

**Boulder Mountain Claims.**—A number of claims have been located on the east slope of Boulder mountain, between Birch and Boulder creeks, about 12 miles in a northwesterly direction from Atlin; of these the White Star Group of three claims owned by Captain Wm. Hawthorne, R. N., and the Lake View group of three claims owned by Jos. Clay have been the most explored. Other claims between and adjoining these groups are also being held, and on some of them the same veins are supposed to outcrop that are found on the Lake View and White Star properties.

A few samples have been obtained from these Boulder mountain deposits that assayed from \$100 to \$300 per ton and one or two are even claimed to have given higher results, but an average of the veins would probably not exceed \$10 and might be somewhat less. From the various tests that have been made, however, it is hoped that some of this quartz will pay for mining when such can be conducted economically. In all probability, numerous other veins will be discovered in this vicinity, as the mountain is in most places covered with a mantle of superficial materials that hide the bed-rock and whatever ores it contains.

**The Laverdiere Group.**—The Laverdiere group is owned by three brothers, Messrs. Noel, Frank, and Thomas Laverdiere, and consists of six claims, three of which are crown-granted, and two fractional claims. This property is situated on the west side of Hoboe creek, about 2 miles from where it runs into West bay which forms the upper end of Torres channel, an arm of Atlin lake. The principal ore-body on the Laverdiere group, or at least the one most highly valued and that on which the bulk of the development has been expended, is described under 'contact-metamorphic deposits.' In addition two fissure-veins have been discovered on the Alvine and Brothon claims respectively, that appear from the limited amount of work that has been performed on them, to belong to the 'gold-silver quartz veins' and so will be here described. It is possible, however, that they would be more appropriately classed under 'high-grade silver veins.'

The vein on the Alvine claim strikes approximately N. 30° W., has an average thickness of about 2 ft., and occurs in the Coast Range granitic rocks. This deposit consists almost entirely of a gangue of quartz which is in most places somewhat stained with iron-oxide, and with which is associated a small amount of white calcite. Disseminated through this gangue is nearly everywhere more or less argentiferous tetrahedrite (grey copper containing silver); occasional small particles and flakes of native silver also occur. It is not known what this ore will assay, but its general appearance warrants the expenditure of sufficient work to more thoroughly explore the vein.

On the Brothon claim, another mineralized fissure occurs in the Coast Range granite rocks, strikes N. 25° E., has an almost vertical attitude, and can be traced from near the level of the valley-bottom several hundred feet up the mountain side. In places this fault includes between its walls several inches of quartz which is associated with some calcite, and contains more or less galena and tetrahedrite, and also occasional particles and flakes of native silver. Near the valley this fissure includes only about one-fourth of an inch of decomposed clayey material through which, and the somewhat altered and replaced walls



for 6 and 14 inches on each side of the fault, is a certain amount of disseminated argentiferous tetrahedrite and native silver. Assays of the mineralized wall-rock have been obtained that gave results as high as 600 ounces and it is claimed that a zone 12 to 14 in. in thickness, bordering the fissure, will average from 20 to 30 ounces of silver per ton.

#### **Cupriferous Silver-Gold Veins**

The veins considered in this report as belonging to the cupriferous silver-gold class, have been found in Atlin district only on Table mountain which is situated on the north shore of Graham inlet opposite Taku Landing. The only two deposits on this mountain that have been at all developed occur on the Petty and Dundee groups respectively, and occur in granite-porphry, which is intrusive in Chieftain Hill andesites and andesitic tuffs. The veins consist mainly of quartz, calcite, galena, chalcopryite, pyrite, malachite, and azurite, which minerals occur also to some extent disseminated through the wall rocks. The Petty vein where exposed is from 6 in. to 2 ft. in thickness and has been traced for over 100 ft.; the Dundee vein has a maximum known thickness of 2 1-2 ft., but has not been followed more than 50 ft.

#### **Silver-Lead Veins**

Silver-lead veins are known to occur in Atlin district, only on Mt. Leonard, on the north face of which, in the vicinity of Crater creek, are located the main deposits of this class examined by the writer. When the locality was visited in October, 1910, about a dozen claims were held on Crater creek and in the vicinity; of these, those on which the most development had been performed, and which have the most promising appearance, belong to the Big Canyon group. Two smaller veins on adjoining ground were also seen. A number of other veins are known to occur in the vicinity, but owing to the lateness of the season and stormy weather with considerable snow, these were not examined.

The veins seen are all strikingly similar and vary chiefly only in size and degree of mineralization. The ores all occur in dark-greenish diabase dykes which have invaded the surrounding granitic formation, and the general description given below of the deposits on the Big Canyon group applies to all the veins in the vicinity.

**Copper Veins.**—Copper veins are known to occur in Atlin district at only one point which is situated on the southwestern corner of Copper island in Atlin lake. Several claims were held there for a number of years by the Laverdiere brothers, but were allowed to lapse during the year 1910.

A number of veins from a fraction of an inch to 6 in. in thickness occur in fissures in basaltic rocks. They consist mainly of calcite; but also, in places, contain particles and masses of native copper, the largest of which known to have been found, is reported to have weighed about 40 lb. A certain amount of malachite (common green copper stain), as well as rare particles of cuprite (red oxide of copper), and tenorite (black oxide of copper) occur as oxidation products of the native copper.

#### **Antimony Veins.**

Antimony veins were noted in Atlin district at only one point which is situated on the west shore of Taku arm about 10 miles below (north of) Golden Gate. Two claims, the 'Lake Front' and the 'Antimony,' have

been located there by Messrs. James Johnson and C. B. Dickson respectively.

The ore occurs in the form of bedded veins that conform, in a general way, to the stratification planes of the enclosing rocks which lie almost flat and consist mainly of the dark greyish to almost black, finely textured, shales of the Jura-Cretaceous, Laberge series.

#### **Contact-Metamorphic Deposits**

Contact-metamorphic deposits of economic interest have been found in Atlin district in only one locality which is situated on Hoboe creek near the upper end of Torres channel, an arm of Atlin lake.

The valley of Hoboe creek has an average width of about one-half mile, is flat, and contains numerous, swampy meadows which are the result, to a great extent, of beaver dams at different points on the stream. Schists, quartzites, limestones, etc., of the lower Paleozoic Mt. Stevens group apparently underlie a considerable portion of this valley and, for a distance of approximately 2 miles from Torres channel, extend up its western slope as well. Adjoining these rocks on the west are the Coast Range granitic intrusives which constitute the high, steep-sided hills to the west and south. The contact-metamorphic ore deposits are included in the Mt. Stevens rocks near their contact with the granitic intrusives.

Along this contact, the Laverdiere and the Callahan groups of claims have been located.

**The Laverdiere Group.**—The Laverdiere group is owned by three brothers, Messrs. Noel, Frank, and Thomas Laverdiere, and consists of six claims, and two fractions. Three of the fractions were located in 1899 and have since been crown-granted. In addition to the contact deposit which is here described, two mineral veins have been discovered on this property and are described above under 'gold-silver veins.' The main workings on the Laverdiere group are situated on the western edge of the valley of Hoboe creek, 1 1-2 to 2 miles from the mouth of the stream.

**The Callahan Group.**—The Callahan group, owned by Mrs. Callahan, consists of six claims which adjoin the Laverdiere group on the north and extend in a northerly direction to the upper end of Torres channel, known as West bay. The contact between the Mt. Stevens rocks and the Coast Range intrusives passes through these claims, but is in most places concealed by superficial materials and by forest growth; wherever the contact is exposed, however, ore materials occur in the vicinity much resembling those on the Laverdiere property. These deposits have not been at all developed, the assessment work having been performed on various quartz veins which are generally lens-shaped. These occur mainly in greenish schistose rocks and are prevailing only a few inches, but in places are as much as 6 ft. in thickness; they show generally only a small amount of pyrite, but are claimed to contain also native gold.

#### **Coal**

No coal in place had been discovered in Atlin mining district to October 1, 1910, but a considerable amount of float and wash coal had been found near the summit of Sloko mountains, at a point to the northeast of and overlooking the lower end of Sloko lake, and a number of claims, generally known as the Sloko Lake claims, were located to cover the supposed coal seams presumed to occur in that locality. The nature of the detrital coal shows that it has come only a short distance, and Tantalus conglomerate (which wherever



found in southern Yukon is associated with coal seams), is exposed immediately above the coal float; it, therefore, appears as if a small amount of work should uncover the seams from which the float is derived. As the float and Tantalus conglomerate have been found near the summit of the mountain, the seams when found, unless they can be traced down to lower, more accessible points will not be profitably workable.

Tantalus conglomerate has been found elsewhere in Atlin district, and in all probability coal will yet be found in other places besides in the vicinity of the present Sloko Lake claims.

A seam of coal, 4 ft. thick, is reported to occur on Taku river to the south of Atlin mining district.

## STONY CREEK OIL AND GAS FIELD, NEW BRUNSWICK\*

By G. A. Young.

The present developments of the Stony Creek field are confined to an area about 2 miles long by  $1\frac{1}{2}$  miles broad, fronting on the west bank of Petitcodiac river and lying between Stony creek on the north and Weldon creek on the south. Between the two creeks the land rises rather rapidly from the level of the tidal river to an altitude of 460 ft. Of the 23 wells drilled by the Maritime Oilfields Co., 4 are on the steep east front of the hill and the remaining 19 are scattered over the top of the hill.

Along the river front, strata of the Albert series are visible at low water over a stretch of about 2 miles. At the north end of the section they are overlain by coarse, red conglomerate; proceeding southward, at the first exposures they lie nearly horizontally, beyond this they dip in various directions between south and west, at angles of 10 deg. to 20 deg. The measures consist of thin-bedded limestones and dark shales with sandstone beds which in places are impregnated with hydro-carbons. The measures apparently lie on the crown of an anticline, but there are indications that in places the strata are crumpled and faulted.

The lower slopes of the ridge facing the river to the east and the valley of Weldon creek to the south, are occupied mainly by nearly horizontal coarse red conglomerates and sandstones with some shales. These measures are conformably overlain by the quartz conglomerate and over this, by the light colored sandstone of the Millstone Grit. Possibly the lower, red strata belong to the Millstone Grit, but it may yet be proved that they are considerably older. On the north side of the ridge along the valley of Stony creek, the measures underlying the pale colored Millstone Grit beds consist of red and green shales, and sandstones, with beds of grey sandstone, quartzose conglomerate, etc. Thus the Albert series outcropping along the eastern base of the hill extends westward under it, as shown by the borings, and is overlain by red strata capped by grey beds. The Albert series is of very early carboniferous age, the grey beds of mid-carboniferous age. The exposures indicate, in general, that the measures of all the divisions have relatively gentle dips.

The wells stand at elevations varying between 250 ft. and 460 ft. above sea-level, and in depth they range from 1,200 to 2,060 ft. After passing through a thickness of overlying formations usually amounting to about 350 ft., they enter the Albert series, of which a

maximum thickness of 1,800 ft. has been penetrated without encountering any signs indicating the approach of the base of the formation.

The strata of the Albert series, as found in the various wells, consist mainly of thinly bedded, shaly beds, usually black or dark green in color and varying in composition from argillite to limestone. Besides the shaly strata, fine-grained quartzose sandstones are comparatively common, the number of individual sandstone beds in a single well varying between 3 and 15. In thickness the individual sandstone beds vary from a few feet to 100 ft. or more. There is a rather general tendency for the sandstone beds to occur in groups, in a number of instances three such groups separated by intervals of 150 to 350 ft. of shales being encountered in a single well. The aggregate thickness of a single group of sandstones may rise to 180 ft., but more often lies between 3 and 90 ft. The individual beds of a group of sandstones may be separated by shaly layers varying in thickness all the way from a few feet to 30 ft. or more.

Though slight traces of oil or gas have been found in the shaly beds and, in one instance, in strata overlying the Albert series, the oil and gas are confined practically to the sandstone beds in the Albert series. In the case of one well which the drillers recorded as apparently passing through disturbed, broken strata, practically all the sandstones are free from oil or gas. In the producing wells, a small number of sandstone beds do not afford any trace of oil or gas. Usually the number of such dry beds is small in comparison with the total number of sandstone beds in a well; and the dry beds, as a rule, occur towards the top of the well, but such beds are also recorded as occurring beneath others with showings of oil or gas. Usually by far the greater number of the sandstone beds are recorded as at least showing oil or indicating the presence of gas, and in some of the wells, sandstone beds of two different horizons yield large volumes of gas.

In the case of about one-half of the number of the wells, all the sandstone beds (except such as are dry) of each well are recorded on the logs as being either all oil sands or all gas sands. In the remaining cases, oil and gas sands irregularly alternate or they occur in two groups of which, in some wells, the oil sands form the higher group while in others the gas sands form the higher group.

In two wells, strong flows of salt water were recorded. In one case the salt water was struck near the bottom of the well, being first met in a 12 ft. sandstone bed lying 68 ft. below an oil sand that, with other immediately overlying sands, yielded oil at the rate of 5 barrels per day. In the second instance, after having passed through two sands, both giving indications of oil, and one giving a small show of gas, a salt water sand was struck at a depth of about 810 ft. This well was continued to a depth of 1,250 ft., and in the additional distance of 440 ft. passed through four beds of sandstone with an aggregate thickness of 245 ft., but which were barren of oil or gas except in the case of the lowest bed, which was said to give a "show of gas."

From seven of the wells the total calculated yield of gas, as derived from measurements made with a Pitot tube, was nearly 4,000,000 cubic ft. per day, the closed pressure of the individual wells varying from 20 to 200 lb. per square in. From twelve other wells, varying results were obtained. One well had a closed pressure of 525 lb., rising in three days' time to 610 lb., and an

\*Extract from Guide Book No. 1, published by the Geological Survey for the Twelfth International Geological Congress, Aug., 1913.



estimated flow of 3,695,000 cubic ft. per day; a second had a closed pressure of 475 lb., and an estimated flow of 8,893,000 cubic ft. per day; and a third had a closed pressure of 560 lb., with an estimated capacity of 6,417,000 cubic feet per day. In these three cases, the volume was estimated from observing the rate of rise of pressure at one minute intervals. As regards oil, in the case of one well, 60 barrels accumulated in 20 hours; from another after an interval of 7 days, 87 barrels were pumped; while a third gave an estimated yield of 40 barrels in 25 hours. The above figures have been taken from records of the Maritime Oilfields Co., who are developing the field.

## MUD-LADEN FLUID APPLIED TO WELL DRILLING

In a bulletin issued by the U. S. Bureau of Mines, Messrs. J. A. Pollard and A. G. Heggem say that one of the greatest wastes of natural gas is that which often takes place in drilling oil wells. If a well is being drilled by one of the usual methods, the gas becomes a hindrance to drilling, and the driller regards it as a nuisance; or the gas may be found in a field where it has little or no immediate commercial value, and hence is allowed to escape into the air without restraint. For preventing this waste the usual dry-hole methods of drilling are unsuitable.

When an open hole is bored into a bed containing gas under pressure, the gas flows toward the hole because of the reduction of pressure at the hole. The movement of gas is therefore always from a greater to a lesser pressure. If some means be provided for keeping the pressure within the well greater than the pressure in the gas sand there will be no flow of gas into the well. The requisite pressure may be obtained by a column of water in the well, provided the gas pressure be not greater than that of the water when the well is full. However, the use of clear water is sometimes impracticable and is always undesirable. The action of clear water on the walls of the well causes caving, and an attempt to use clear water in drilling the well invites trouble and may injure the producing sands. By mixing clay with the water the results obtained are entirely different.

The use of clay-laden water, while not new in well drilling, having been used with rotary rigs for years and employed in 1901 for drilling the first successful oil well in the Beaumont (Tex.) field, was not applied previous to 1913 in drilling by the dry-hole method with a cable rig. Already the advantages of the method have been demonstrated, and there can be no question as to its efficiency when properly used. Too much emphasis cannot be placed upon the importance of using it where gas and water are encountered, for it not only greatly reduces the danger to workmen, but effects a great saving in the amount of casing needed and entirely eliminates the waste of gas while drilling is in progress.

In the Mid-Continent field alone during the past year there have been a large number of deaths and serious accidents from blow-outs of gas from wells being drilled. These accidents and the great hazard from fire risk, to say nothing of the great waste of gas, cannot happen if the mud-laden fluid method be properly used.

In one small field as much as 100,000,000 to 150,000,000 cubic feet of gas a day has been wasted in the effort to obtain oil. Such great waste is believed to be

altogether unnecessary, for preventive methods have been shown to be entirely practicable. Aside from increasing safety and preventing waste, the methods offer a further advantage in that they absolutely prevent the contents of one bed mingling with those of another; thus water cannot enter the pay sands, neither can oil or salt water contaminate the fresh water of other beds.

The term "mud-laden fluid" is applied to a mixture of water with any clay which will remain suspended in water for a considerable time. The fine sticky clays that in many places are termed "gumbo" are well suited for this purpose.

Some oil workers have thought that "mud-laden fluid" implies the use of any of the drillings from the well; but this is not the case, for if any coarse material in the drillings, such as sand, is used it will settle in the well and prevent the bit from striking the bottom of the hole. The proportion of clay that should be mixed with water to insure the best results is about 20 per cent. by weight. With this proportion of clay in the water it is impossible for the driller, no matter how experienced he may be, to tell whether there is any clay at all in the hole, for the tools work about the same as they would if the hole were filled with clear water. An excellent idea of the consistency required can be obtained by comparing the action of a stream of sand pumpings, or muddy water, running in a ditch with that of clear water. The sand pumpings contain fine material that is deposited on the walls, and especially the bottom of the ditch, where it forms an ever-thickening protective coating; clear water, on the other hand, cuts away the sides and bottom of the ditch and may cause it to cave. Between clear water and water containing more mud than can be held in suspension by the current, it is possible to find a mixture of clay and water that will deposit part of the clay as a fine, protective coating while the rest of the clay remains in suspension and passes through the ditch.

The action of the mud-laden fluid on gas rocks or gas sands, or other porous formations, can be likened to the action of muddy water going through a filter. In any filter that has been used for some time, it will be found that most of the sediment from the water has been deposited on the surface of the filter, but some of it has entered the filter, the proportion diminishing with the distance penetrated.

The distance to which clay from the fluid in a well will penetrate a porous formation depends on the excess of pressure produced by the column of fluid or by the pump, and also on the porosity of the formation but finally no more water will go through.

Some drillers contend that clear water should have the same effect as the mud-laden fluid, but the results of trials have shown that it does not. Many wells can not be filled with clear water, because the water continues to flow into the rock or sand without any clogging effect and in consequence does not rise high enough in the well to give a pressure sufficient to overcome that of the gas. Drillers have attempted this method, using clear water, and have permanently drowned out a gas sand. Further than this, clear water causes the walls of the well to slack and cave and "freeze" the pipe.

The action of the muddy water is entirely dissimilar. The fluid enters the porous stratum for a short distance, and deposits clay that clogs the openings and finally prevents the further inflow of fluid.

In order to save time in preparing the clay and water mixture for a well it is recommended that a slush pit,



about 15 or 20 ft. long, 10 ft. wide and 3 ft. deep, be dug close to the derrick. The place for this pit does not matter much, except that it should be on the lowest side of the derrick, so that when the well is bailed the fluid will run into the pit without trouble. When a well is being drilled through beds of clay the drillings from these beds can be turned into the pit as they come from the well and thus be saved and kept from becoming mixed with sand and shale drillings. Care should be taken not to mix with this fluid any material that will not stay in suspension. Not more than half a day's labor is necessary to prepare the fluid for the well, and the work can be done by ordinary unskilled laborers.

The pump recommended for use in handling the mixture of mud and water is known in the oil business as a "duplex slush pump," fitted with removable liners and rubber valves. These pumps may be obtained in many sizes, some of them weighing about 4,000 lb. Such heavy pumps are costly and are expensive to move from one well to another; consequently the old style 8 in. by 5 in. by 10 in. pump, which weighs less than 2,000 lb., seems best adapted for this work.

There are several methods of introducing the clay and water into a well.

Before gas is encountered in a well that has been drilled in the most advantageous manner, several hundred feet of the hole may be without casing. To prevent the walls from caving, as might happen were the fluid pumped directly into the top of the well, a string of tubing reaching to the bottom of the well should be placed to conduct the fluid. The fluid is then pumped in until the well is filled.

If, after gas has been struck, the well is blowing gas, and the conditions are such that the gas can be shut in, recourse may be had to a method which has been named the "lubricator system," which consists preferably of two joints of 10 in. casing placed above a master valve on the head of the well and having a second gate valve at the top. These valves and casings can be most readily attached to the well by assembling them on the ground and placing them on the well as a unit. It is dangerous to attempt to put a valve or a single fitting on a gas well by handling the valve or fitting in slings.

As soon as the valves and the two joints of casing, which are termed the "lubricator" are in place, the bottom valve is closed. The mud-laden fluid is then pumped into the two joints of casing, and when they are entirely filled the upper valve is closed and the bottom valve is opened. Following the equalization of pressure throughout the device, the mud-laden fluid drops to the bottom of the well. As soon as the fluid has passed the lower gate valve, as shown by the sound when the casing is struck, this valve is closed and the upper valve is opened. The volume of gas that escapes from the hole is equal to the volume of fluid that has been introduced, and therefore the pressure of the gas in the casing is not increased. After a few repetitions of this operation a part of the fluid is forced out of the bore hole into the porous strata. Then the gas remaining in the hole will expand and its pressure will be lowered. The amount the pressure is reduced is an indication of the amount of fluid forced into the porous formations. By repeating the operation described there is finally established in the well a column of fluid sufficient to overcome the gas pressure, and then the remaining space can be filled by pumping directly into the casing.

When gas is blowing from a well and cannot be shut in, perhaps because of the small amount of surface casing in the well or possibly because of the casing not being properly seated, so that gas is forced up outside the casing when the valve is closed, another method is used.

At such a well it becomes necessary to insert a string of tubing, with a back-pressure valve at the bottom, to a point below the gas sand. After the tubing has been lowered to the proper depth it is packed or sealed off with a casing-head tee previously placed on the well. To control the flow of gas a gate valve should be placed on the lateral discharge of this tee. As soon as the mud-laden fluid is started down the well through the tubing, the gate valve on the tee can be partly closed in such a manner as to throttle the outlet and to prevent the mud-laden fluid from being forced out of the well by the gas pressure.

The amount of throttling necessary can be determined only by the man in charge, as similar conditions will not prevail at any two wells. However, it is not difficult to ascertain how much the gas should be throttled to stop the fluid from being thrown out of the well. If a well is emitting water with the gas, the fluid can be put in just as readily in this manner, and a well with a capacity of 40,000,000 cubic ft. of gas and several thousand barrels of water daily can be controlled in 15 or 20 minutes. As is evident, the full rock pressure of the well is not maintained in the casing, and consequently no blow out follows, as would happen were the gas forced to the surface on the outside of the casing.

Sometimes the gas in a sand has a greater pressure than that of the mud-laden fluid in the well. When this happens the fluid is blown out and the well becomes wild. It is then necessary to use a pump to establish a greater pressure in the muddy fluid than that of the gas, in order to force the mud into the sand. A sufficient pump pressure should be allowed to remain on the well for at least two or three hours and then relieved very slowly and carefully. If the pressure is suddenly reduced, not only may the column of fluid be violently ejected and the casings, fittings and derrick wrecked, but the well may cave. If the extra pressure is maintained for several hours and then released slowly, the tools can be put into the well and drilling resumed, because the porous bed is clogged around the tools and also below them to some depth. Great care should be taken, however, not to drill too deep at one time without applying the necessary pump pressure, because the clogged portion is shallow and may be drilled through in a short time. By repeating the procedure just described, the well can be drilled through the formation in which the gas pressure is greater than that exerted by the column of fluid. Each time that pressure is applied by the pump the mud-laden fluid is driven into the bottom and sides of the bore hole, thus excluding the gas from the path of the bit, so that when drilling starts again the tools are drilling in a formation that has been filled with the clay from the fluid.

The presence of the mud-laden fluid within the well does not interfere with drilling. The bailer can be used in the usual way to remove the drillings from the bottom. In the usual dry-hole method of drilling through a formation from which gas is escaping the drillings are blown out of the well and cannot readily be saved for examination, whereas with the mud-laden fluid method samples of the formation are readily obtained.



It has been stated by some that in hard limestone too much time would be lost if mud-laden fluid were used, because the tools would not drop readily in the fluid. However, at some wells in the Cushing (Okla.) field as much as 22 ft. has been drilled through the Wheeler limestone in 18 hours, so that apparently the tools work better in the fluid than they would if the gas were blowing, as it often takes from six to eight days to drill through such a gas sand. Not only is less time consumed by the new method, but the risk of fire and danger to workmen from blowouts is obviated. Many instances can be cited of gas pressures so strong that it was impossible to drill through the gas sand into the oil sand below, and consequently the well had to be shut in and called a "gasser," though perhaps there was no market for the gas. In drilling gas wells by the mud-laden fluid method the well can be sealed when gas is struck, thus maintaining the initial rock pressure of the well, so that if it be desired to drill a number of gas wells near each other the rock pressure of the later wells will not be decreased by the drilling of the earlier wells.

In drilling through limestone with the mud-laden fluid in the bore hole great care should be taken not to drill too much hole at one time, as experience has proved that limestone drillings, when too much hole has been made, will settle back around the tools and "freeze" them in the well while the temper screw clamps are being removed and the bull ropes thrown on preparatory to withdrawing the tools.

From observations of engineers of the bureau, it is recommended that not more than 3 ft. of hole should be drilled at one time in limestone with the fluid in the well. If this rule be observed, it is impossible for the drillings to stick the tools. The drillings can be removed with an ordinary dart-bottom bailer, but it has been found from experience that the patent-bottom bailer is preferable.

Casing a gas well with the fluid in the hole can be accomplished in a few hours without the slightest risk to the workmen. On the other hand, several days have been required to case wells that were blowing and on account of the danger from \$7 to \$10 a day each had to be paid to men to work in the gas.

Should it become necessary to carry casing while drilling, or, in other words, to allow casing to be put in as drilling proceeds, the mud-laden fluid will be of great assistance. The pressure of the fluid on the walls of the well prevents them from caving and freezing the pipe. Under-reaming can be accomplished in the same manner. It is sometimes possible with this method to carry the casing from 1,000 to 1,200 ft. through a caving, sandy formation, in which a well could not be drilled by other methods.

In drilling a "combination" gas and oil well by the mud-laden fluid method, the fluid is put into the well just before the gas sand is reached, after which drilling proceeds to a point below the gas sand and the next string of casing is inserted. Before this inner string of casing is seated on the bottom (which can be done either with a packer or shoe, as the case may be), the fluid inside the casing is bailed down, allowing that on the outside of the casing to recede at the same time. A Braden head is attached to the next outer string of casing and packed. The gland of the Braden head is prevented from taking a friction hold on the pipe by two or three small blocks of wood; then when the fluid has been removed to such a depth that its hydrostatic head is less than the gas pressure, the remaining fluid can blow out of the well. The casing is then seated on the bottom and the Braden head bolts,

already put in place, are tightened. The seating of the casing in this manner will turn the gas up the outside of the inner casing and expel through the Braden head that part of the fluid between the two casings, so that when the well is cleaned, which will not take more than a few minutes, the valves of the Braden head can be closed and drilling can proceed into the oil below in the usual manner.

To place a casing properly, the drill hole must be large enough to allow the couplings to slip freely down the hole. There is therefore a space of an inch or more between the casing and the walls of the hole. This makes a free path around the casing, which allows water, oil or gas to pass from one formation to another. The water may drown out the oil or gas, the gas may escape into porous strata, reducing the pressure below commercial value, and the fresh water in any formation penetrated may be spoiled by salt water.

Such conditions cannot obtain when the mud-laden fluid process is used. The space between the casing and the wall of the hole is filled with the fluid, and all porous formations are sealed with clay, so that oil, water or gas cannot flow from one formation to another.

### BOOK REVIEW.

**METALLURGY OF COPPER**—By H. O. Hofman, Professor of Metallurgy in the Massachusetts Institute of Technology. McGraw-Hill Book Co., 1914. Price \$5.00. For sale by book department Canadian Mining Journal.

In this book the author presents an up-to-date treatise on the metallurgy of copper. Present modes of operating are described and principles explained. The examples of practice are mainly from United States metallurgical works.

Several chapters are devoted to description of copper and its alloys and compounds. Physical and chemical properties, impurities, alloys, compounds, and ores are chapter headings.

Chapter VII. entitled "Smelting of Copper" makes up the greater part of the book. This chapter is subdivided into four parts: A, Smelting sulphide copper ores; B, Smelting oxide copper ores; C, smelting native copper ore; D, Fire-refining of impure copper.

Chapter VIII. is devoted to the leaching of copper ore, matte and metallic copper.

Chapter IX. is entitled Electrolysis of Copper.

Dr. Hofman writes with authority and this book has been written after visits to and detailed studies of the leading copper smelteries and refineries of the United States.

### CHROME IRON ORE.

It is reported on good authority that Chrome Iron ore has been discovered in the Township of Warden, North of Matheson on the T. & N. O. Ry. The orebody is reported to be 5,000 ft. long and from 150 to 300 ft. wide and occurs in serpentine and peridotite rock.

Chrome ore has been mined in Canada for over 20 years in the Eastern Townships of Quebec, in the vicinity of Black Lake, P.Q. The occurrence of the ore is confined to the southern fringe of the Black Lake-Thetford Serpentine belt, where the Dominion, the Black Lake Chrome and Asbestos and the Canadian Chrome Co. have been operating for a number of years. The ore occurs in the disseminated as well as the crude state, the former being refined in stamp mills and the latter sold after going through a cobbing process. The chief source of supply, according to Fritz Cirkel's "Monograph on Chrome Ore," are the deposits in New Caledonia, and in European and Asiatic Turkey.



## THE MINER AS A PIONEER\*

By T. A. Rickard

It is a common saying that agriculture and mining are two basic industries. When man rose above the brutish individualism of his primordial state and began to develop the social instinct, he turned to the soil, in order to win food for his family. He paused in his migration, the soil held him; it gave root to his rudimentary community; it gave him the chance to enlarge his energies. His tracks became highways; his rivers, avenues of trade; and as his traffic expanded, so his imagination widened, until, out of the crudities of communal development grew the complexities of civilization.

But the nomadic habit lingered; the spirit of the hunter survived in man; a wanderer and a wonderer he stood beneath the starry dome of the forest arch not knowing whether he were the guest or a captive in the domain of Nature. The hills beckoned; the seas called; the more venturesome left the tents of the tribe in search of material wherewith to fashion their implements. They sought iron for weapons, copper for tools, gold for ornament, and found them in various guise in the earth under their feet. They became miners. To those who delved successfully came power. Throughout the ages the more energetic and adventurous broke from the plough and forsook the cattle in order to explore and to exploit. They brought the metals from which the artificers fashioned engines of power and machines of intelligence. They won the materials for a social structure that, based on stone and built in iron and copper, soared in many-storied tracery of steel to towers radiant with light and vibrant to the sky—towers so far above the common ground that man almost forgot his lowly origin and claimed kinship with the stars.

The story of mineral exploration and racial migration is peculiarly the heritage of our people, the Anglo-Celts. It is the motif that runs through the drama of English and American history, more particularly during the last hundred years. Even in its barest outlines it serves to suggest that the miner is the pioneer of industry and the herald of empire.

The first social organizations around the shores of the Mediterranean sent their prospectors to the hinterlands of Europe, Asia, and Africa. The gold of Ophir, the copper of Sinai, the silver of Laurium were part of the web and woof of these early civilizations. The mines of Iberia gave Hannibal the sinews of war against Rome, and the gold of Davia strengthened the resources of Rome under Trajan. But the greatest adventure was that of the Phoenicians who passed through the Pillars of Hercules into the western ocean in order to reach the far Cassitorides, the tin islands that in turn were to produce those Cornishmen to whom the world is one big mine. After Carthage and Rome, in turn, had been overthrown, the mining industries of the known world were disorganized. Desultory operations persisted in Hungary, Spain, and Saxony, but the Middle Ages to the miner were as dark below ground as above. Even the discovery of America, which marked the beginning of a new world movement, was not connected with a real advance in mineral exploitation, although associated with the winning of gold and silver. It is true, the wave of Spanish conquest broke over the American continent, penetrating the treasure-vaults of Mexico and Peru. But the Spaniard devastated, he did not develop. He gathered the harvest that the patient Indian has sown by the laborious toil of cen-

turies. Cortez and Pizarro were filibusters not explorers; they were pirates, not miners. The conquistadores were no pioneers of industry; behind them arose the smoke of ruin and the dust of destruction. Even the great sea-captains of Elizabeth were but the sequel to an epoch of spoliation. After them, and in their wake, across the sea, came the men who from Cornwall and Devon, from Saxony and the Harz, brought the technique of mining to the new world, applying it peacefully to the mineral development of Mexico, Peru, and Chile, all along the regions previously ravaged by European freebooters.

But the great era of mineral exploration came with the discovery of gold in Australia and California. It was the prelude to a worldwide migration, an enormous expansion of trade, a tremendous advance in the arts of life, and the spread of industry to the waste places of the earth.

The color of energy began to tint the blank spaces on the map. The western half of the North American continent, all of Australia, the southern half of Africa, the northern half of Asia, were invaded, penetrated, and explored by those in search of gold, of other metals, and as each successive mineral discovery was made by the miner he called upon his fellows to come and take a hand in the good work. He was the scout far ahead of an army of development. Trade follows the flag, it is true, but the flag follows the pick.

After the prospector has come the mining engineer. The scout has gone in advance of the captain of industry. Those of you that have crossed the range in winter know how the leader breaks the trail by leaving footprints into which his followers tread, step by step, greatly to the safety and ease of their travel. That is what the mineral explorer has done for the mining engineer. That is what the mining engineer has done for those behind him. Some of you have been prospectors as well as engineers.

Again, I ask you to recall how you threaded the pathless forest on your way to examine a new mineral discovery. On the trees at intervals you have seen that the bark was chipped. The trail has been "blazed" by the prospector, making it easy for you and others to follow. That is what the miner has done in a larger way for civilization. He has done it with geographical exuberance and equatorial amplitude. From "the stark and sullen solitudes that sentinel the pole" to the "steaming stillness of the orchid-scented glade" in the Tropics, he has left his mark. You know that. No need for the prospector to complain to you, like Kipling's explorer:

"Well I know who'll take the credit; all the clever chaps that followed—

Came a dozen men together—never knew my desert fears;

Tracked me by the camps I'd quitted, used the water holes I'd hollowed.

They'll go back and do the talking. They'll be called the Pioneers!"

No; not by the men of the Columbia School of Mines, who have shared the prospectors' camp-fire, his blankets, his flapjacks, and his beans. You will give credit to whom it belongs. To the man with the faith of a child and the heart of a viking, to the man who has tramped and toiled until he heard "the mile-wide mutterings of unimagined rivers and beyond the nameless timber saw illimitable plains"; to the miner who has crossed the last range of all and lies in the only prospect-hole he could not dig; to the man who was the herald of empire and the pioneer of industry; to him who blazed the trail.

\*Abstract of a speech delivered at the fiftieth anniversary of the School of Mines, Columbia University, May 29, 1914.



## ONTARIO MINERAL PRODUCTION IN FIRST QUARTER OF 1914

Returns to the Bureau of Mines, Toronto, made under the Mining Act, show that the output of metalliferous mines and works of Ontario for the first three months of 1914 had a total "spot" value of \$9,484,299 as compared with \$9,469,938 for the corresponding period of 1913. That the increase was not greater is due to the lessened production of silver from the mines of Cobalt, which fell off by 680,198 ounces. There were also small decreases in iron ore and pig iron, but these were more than offset by a larger output of gold, nickel, copper and cobalt and nickel oxides. Details are given below. The ton is the statutory ton of 2,000 lbs.

The production of non-metallic substances, though steadily growing, amounts in value to less than one-quarter of the whole aggregate output of the mineral industry, and statistics of such materials are collected for the calendar year only.

Gold, fine ounces . . . . .	61,032	\$1,202,502
Silver, ounces . . . . .	6,519,860	3,549,556
Copper, tons . . . . .	4,135	591,988
Nickel, tons . . . . .	6,641	1,446,012
Iron ore, tons . . . . .	4,536	12,928
Pig iron, tons . . . . .	184,086	2,503,450
Cobalt, tons . . . . .	33	8,898
Cobalt and nickel oxides, lb. . .	248,001	168,965
Total . . . . .		\$9,484,299

**Gold.**—The producing mines were the Hollinger, Dome, McIntyre-Porcupine, Porcupine-Crown, Mines Leasing and Acme, all in the Porcupine district; Tough-Oakes at Kirkland Lake, and Canadian Exploration at Long Lake. None of the other minor fields of eastern or northern Ontario reported any production for the quarter. In all 112,826 tons of ore were crushed, the average yield being \$10.65 per ton. The bulk was from Porcupine: 104,880 tons raised from the mines of that camp yielded \$1,148,175 or \$10.95 per ton.

Hollinger worked steadily and continues to make good profits, the monthly dividend of \$90,000 being easily sustained. At 31st March the cash surplus on hand was \$753,446.91. The lowest level from which ore is being raised is at a depth of 550 ft.

The annual report of Dome Mines Limited for the year ending 31st March definitely places this large deposit in the low grade class. It is proposed to work the mine on a non-selective policy, to which end the plant is undergoing enlargement from 40 to 80 stamps. The new mill is expected to be in operation in June, 1914, and the total crushing capacity will then be 28,000 tons per month. The ore reserves, wholly or partially developed, above the fifth level (420 feet vertical) stand at 512,600 tons valued at \$4.81 per ton, and 2,000,000 tons worth \$3.50 per ton. A large amount of diamond drilling has been done below the present development and west of the open pits, which indicates the presence of large bodies of gold-bearing material, but no estimate is made of their magnitude or value. There were milled during 1913, 145,305 tons of ore, which yielded \$1,204,598 or \$8.29 per ton. Operating costs, exclud-

ing all charges against development, averaged \$3.08 per ton, a reduction of \$1.49 per ton. When the enlarged plant is in operation, it is believed this charge can be reduced to less than \$2.50 per ton.

Much interest continues to be taken in the rich narrow veins of Kirkland Lake, where the development is being undertaken chiefly by English capital. It is reported that the Cordova mine in Peterborough county is again about to be worked.

**Silver.**—It is probable that the crest of production at Cobalt has been reached, and that in all likelihood the output will henceforth decline. For the three months, the falling-off is less than half a million dollars in value as compared with the first quarter of last year. As certain of the older mines lower their output, production is kept up by the discovery of new veins in other properties and by a more extensive utilization of low grade material.

In order of production for the quarter the ten leading mines were the Nipissing, Cobalt Townsite, Coniagas, Kerr Lake, La Rosc, Seneca-Superior, Crown Reserve, Cobalt Lake, McKinley-Darragh-Savage, O'Brien.

During the quarter there were raised from the mines 155,753 tons of ore of all grades. There were concentrated 163,055 tons, part of which came from the dump heaps. This produced 3,163 tons of concentrates, the average ratio of concentration being 51.5 to 1. The shipments of concentrates were 3,058 tons, the average content of which in silver was 824 ounces.

The number of producing mines was 26. Cobalt proper contributed 94.4 of the output, Gowganda 1.4 per cent. South Lorrain 1.6 per cent., Casey 2.5 per cent., and gold ores .016 per cent.

The silver refineries in operation were three in number—those of the Coniagas Reduction Company at Thorold, the Deloro Mining and Reduction Company's works at Deloro, and The Metals Chemical Company, Limited, at Welland; the last named, a small plant. The recovery of silver by these works amounted to 2,481,493 oz. Adding to this quantity the bullion produced at the mines in Cobalt camp itself, it is found that much more than half the product of the silver mines is now reduced to merchantable bars before leaving the Province.

The refinery at Orillia owned by the Canada Smelting and Refining Company, which was consumed by fire, has been rebuilt and is now about ready for operation.

**Nickel and Copper.**—The mines of the Sudbury region were actively worked during the quarter, the nickel product being 330 tons greater than for the first three months of 1913, and copper 1,060 tons. The quantity of ore raised was 252,916 tons, and of ore smelted 276,859 tons. The Bessemerized matte product was 13,372 tons, containing 80 per cent. of metal 50 per cent. being nickel and 30 per cent. copper. The Alexo mine in Dundonald Township sent 2,383 tons of ore to the Mond Company's smelter at Coniston.

The Canadian Copper Company and the Mond Nickel Company continue to produce practically all the ore, the British American Nickel Corporation not having as yet reached the producing stage. The first named concern made preparations to work the No. 3 or Frood mine on a large scale, having built a number of dwellings for their workmen and installed a water system for the new town of Frood Mine, etc., when the dia-



mond drill revealed the presence of another large and valuable body of ore in the Creighton mine, which was looked upon as running low in ores. The Creighton mine being richer than the Frood, the Company is again drawing the bulk of its supply from that property, leaving the Frood for future requirements. The developments of the past year or two in relation to ore supplies have been very satisfactory for all three companies, extensive drilling having shown that the reserves of ore are very large.

**Iron.**—Only the actual shipments of iron ore are included in the production, and these amounted to only 4,536 tons. There was a considerable quantity of ore hoisted at the Helen and Moose Mountain Mines, which will, no doubt, be shipped later in the year. The siderite concentration plant at the Algoma Steel Corporation's Magpie mine is being enlarged, and the outcome of this experiment in the beneficiation of a large low grade body of ore will be watched with interest, as having an important bearing on future ore supplies for Ontario blast furnaces.

The output of pig iron was larger in quantity than during the first three months of 1913 by 3,044 tons, but the value was less by \$2,725—the average price per ton at the furnace having fallen from \$13.84 to \$13.59. The plants making pig iron were those of the Algoma Steel Corporation at Sault Ste. Marie; Canadian Furnace Company, Port Colborne; Standard Iron Company, Deseronto; Steel Company of Canada, Hamilton. Idle Standard Iron Company, Parry Sound; Canada Iron Corporation, Midland; Atikokan Iron Company, Port Arthur. Of 357,168 tons of iron ore charged into the furnaces 318,577 tons or 89 per cent. was imported from the United States, and 38,591 tons or 11 per cent. was mined in Ontario.

**Cobalt and Nickel Oxides.**—The manufacture of by-products from the silver-cobalt ores of the Cobalt district is assuming important dimensions. The output of cobalt and nickel oxides was greater in weight than for the same period of last year by 3,905 lbs. and in value by \$48,465. It would seem that the world's requirements for cobalt oxide are now practically supplied by the Cobalt mines. Much the larger part of the product is exported to England and Germany for distribution to the potteries and porcelain factories of those countries and Europe generally, but part is also now finding an outlet in other uses, such as in steel alloys, plating, etc. The consumption too, is growing, due no doubt to the reduction in price as compared with former years. The proportion of metallic cobalt in the oxide as exported varies from 60 and 61 per cent. to 74 and 75. The production was 185,078 lb. cobalt oxide 41,252 lb. nickel oxide, and mixed cobalt and nickel oxides 57,671 lb.

The 33 tons of cobalt appearing in the table represents the quantity of ore for which the mine-owners were paid. The price works out at about 13.5 cents per pound.

**Chromium and Platinum.**—An interesting find, consisting of chrome ore associated with platinum, was made in Reaume Township, Poreupine District, by Mr. Daniel O'Connor, a veteran prospector of Northern Ontario. Little or no development has yet been done, so that nothing can be said as to the extent or general character of the deposit. The discovery is the more noteworthy in that the accompanying rock, a peridotite, is found to carry microscopic diamonds. These, though of little commercial value, are suggestive of important possibilities.

## LABOR ORGANIZATIONS IN CANADA, 1913.

The third annual report on Labor Organization in Canada, covering the year 1913, has been issued by the Department of Labor. At the close of 1913 the numerical strength of organized labor in Canada stood approximately at 176,000, an increase of nearly 16,000 over the figures at the close of 1912. The estimated membership for each of the three years during which reports on organized labor in Canada have been issued has been as follows:

1911 .....	133,132
1912 .....	160,120
1913 .....	175,799

These figures show an increase in membership of over forty thousand during the two years 1912 and 1913, and suggest a quite remarkable development during so brief a period. The figures indicate that the growth of union membership has been fairly distributed as between international bodies and those not international in character. The bulk of Canadian trades union membership is attached to international organizations. Of the total numerical strength of organized labor for 1913, the membership owing allegiance to international organizations reached the large proportions of 149,577, leaving for all other organized bodies a membership of 26,222. There were in Canada at the close of 1913, 2,017 local trade union branches of all classes, 1,792 having international affiliation, 199 of a non-international character and 34 independent local bodies. These figures show an increase of 154 in international local union branches, a decrease of 26 in non-international and an increase of six in independent bodies. International organizations having in Canada at the end of 1913 one or more local branches, numbered 101, an increase of two during the year. There are thirteen non-international organizing bodies in the Dominion, an increase of three as compared with 1912.

The total trades union membership of the world for 1912 stood at 12,094,490, a slight increase over the number reported for 1911, which was 11,435,498. The union membership during 1912 increased more rapidly in Great Britain than in Germany, the first named country having an increase of over 800,000 and the latter slightly over 256,000, giving Great Britain nearly a half million more of a trades union membership than Germany. The United States stands third, but especially having regard to its much larger population, considerably below Great Britain and Germany.

The report gives some attention to the general scheme of organization which has developed in the federations, district councils and trades and labor councils to be found in the leading industrial centres. Particulars of these various bodies are given.

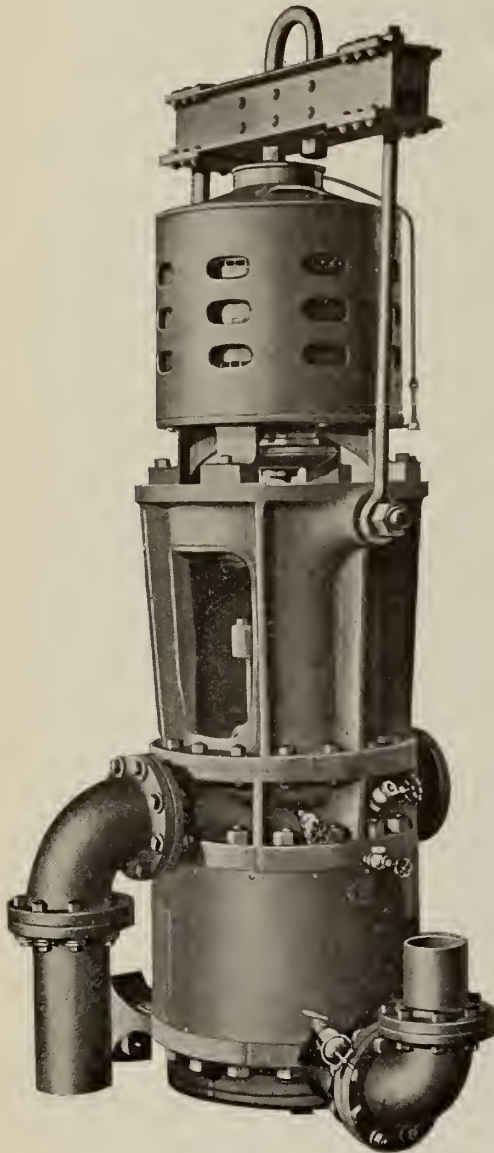
The feature introduced in the report for 1912 showing disbursements made during the year on account of beneficiary work of central labor organizations operating in Canada is continued in the present report. Of the 101 international organizations having local branches in the Dominion, 72 have benefit features of varying extent. The grand total of the disbursements made on account of benefits by these organizations for the last fiscal year is \$14,962,705. Nearly one-half of this amount was expended in death and disability benefits. The payments on this account amounted to \$7,556,876. The railway brotherhoods contributed the larger payments for death and disability benefits, the disbursements by the Brotherhood of Railroad Trainmen alone amounting to no less a sum than \$2,410,985. These disbursements are, of course, for Canada and the United States taken together, separate figures for Canada alone not being available.



### TURBINE PUMPS.

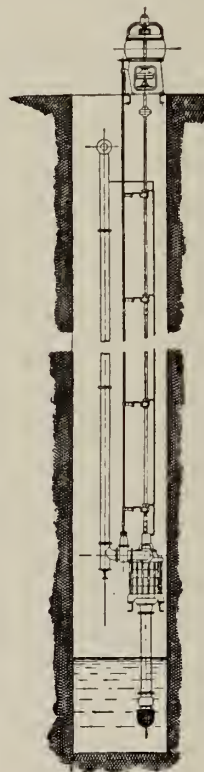
Mining operations afford a wide field for turbine pumps because of the high head against which they can be operated at comparatively low cost, their high speed, which makes them particularly suitable for the advantages of motor drive, the small space which the unit

speed from the impeller, and gradually to reduce its speed until it is converted into an equivalent pressure head. Those stationary guide passages conduct the water without loss to the delivery outlet, or in the case of a multiple impeller pump, to the eye of the succeeding impeller.

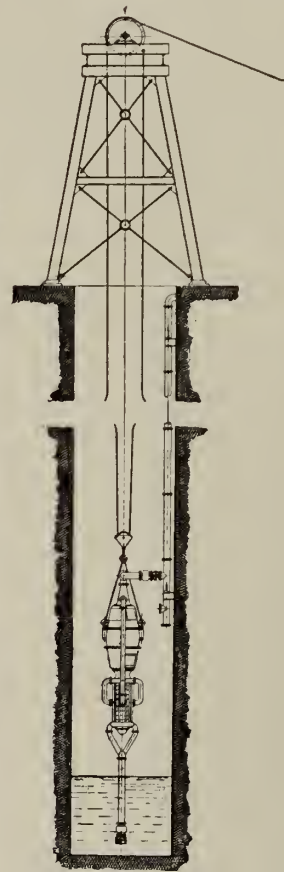


**Mine Sinking Pump**

Three Stage Vertical Turbine Pump, capacity 250 Imp. g.p.m. against 300 ft. head at 1,800 r.p.m.



**Electrically-driven Pump**  
with Vertical Shaft  
sunk in well.



**Electrically-driven Sinking or Unwatering Pump**  
slung in shaft.



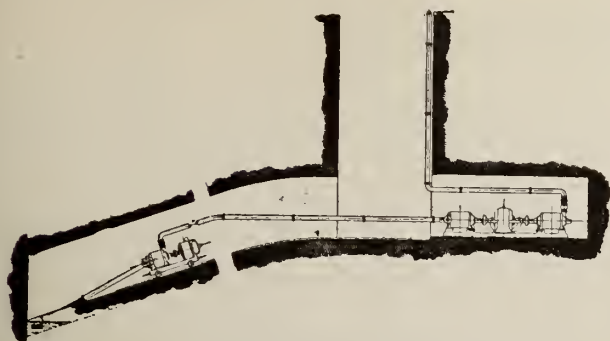
**Electrically-driven Bore-hole Pump**

occupies, and the ease with which the unit can be moved. The accompanying illustrations show some applications of turbine pumps, and a 3 stage vertical turbine pump manufactured by Canadian Allis-Chalmers, Ltd.

The modern turbine pump is a more efficient form of the ordinary and well known centrifugal pump for moderate and high lifts, and consists of a revolving wheel or impeller, similar to that of a centrifugal pump, but discharging into one or more correctly designed passages arranged around the circumference, the object of which is to receive the water or liquid delivered at a high

Modern turbine pumps are made in single and multiple stage types. In the former the required pressure is obtained by means of a single impeller and guide ring, whilst in the latter, the total pressure is the sum of the pressures obtained by several such units working in series. In single stage pumps the maximum head generated is limited by the strength of materials and by local conditions, as, for instance, a high suction lift. The manufacturers claim to have successfully and continuously generated over 400 ft. head in a single stage pump, and over 300 ft. head per stage in a multistage pump.





**Electrically-driven Pump**  
working in bye and delivering to shaft pump.

The turbine and centrifugal pumps manufactured by Canadian Allis-Chalmers, Ltd., are in accordance with the designs and patents of Mather & Platt, Ltd., Manchester, England.

## PROFESSOR RICHARDS OF TECH. RETIRES

With the close of the present term at the Massachusetts Institute of Technology Professor Robert H. Richards will retire from the active work of teaching which he has followed for forty-six years. He is made Professor Emeritus and receives the benefits of the Carnegie Foundation.

Professor Richards has been identified with the Institute since its beginning, for he was a student in the first class, a graduate in the first group to receive the B. S. at Technology, following which he became assistant—1868-1871—and then in 1871 took the chair of Mineralogy, in the department that afterwards developed into that of Mining Engineering and Metallurgy. He it is who developed the splendid laboratories at the institute, and practised himself in the details of the various technical processes; he has been always at the head of his profession, advancing the technique by a number of important inventions.

Professor Richards was born at Gardner, Me., August 26, 1844, but since his schoolday life has been identified with Boston. His activities in any of the directions to which he turned them were always remarkable. In investigation he took up the jet aspirator, looked into amalgamation in the stamp mill, determined the curves of material settling in water, which established the fundamental principles of sorting ore by means of jigs and similar machines. In the same line are the determinations of the settling velocities of quartz and galena, the ground rock being passed into a current of water where the differential settling serves to sort the ore from the worthless rock. The details of various jigs and of the Wilfley table—another sorting device—were investigated by Professor Richards, whose latest work of the kind has been in a variation of the process termed "hindered" settling. Then he has stepped out of the strict province of mining and perfected for civil engineers a prismatic hand telescope for stadia work.

In addition to his work in the class room and laboratory Professor Richards has been in demand as an expert in mining matters and has used his spare time and vacations in professional work of the kind.

In the class room Professor Richards has always been a personality of interest. His lectures have been such as to impress on his hearers the care with which they were prepared, and the teacher has been an example and a stimulus to his students for patient and painstaking work in the interests of accuracy. One of the

Tech Alumni, writing on the subject a few years since says, "These personal qualities in a teacher are sometimes of more importance to the future career of the student than are the actual subjects studied, and the successes that have been attained by many of his graduates have, I think, been due in no small part to these qualities of our mentor."

The laboratories of the Institute in the specialties cared for by Professor Richards were the first of their kind in the world and have been the model for many others since established. That their foundations have been solid and their upbuilding philosophical is shown by their success. A part of this has been through the attitude of Technology in giving as freely as possible of its best for the benefit of the world. It was in these laboratories that some of the first investigations were made of the treatment of ores of the Calumet and Hecla, and in return contributions from that mine aided in the equipment of the laboratories.

His writings have been voluminous more than one hundred titles being credited to his name by the bibliographers. These are largely technical, one, a treatise on ore-dressing, has become the standard work in the practice, and has been referred to by one competent to judge as "A valuable work of reference and a monument to his memory."

But best of all Professor Richards has been a man whom instructing staff, students and the outside world which came into his sphere of influence admire. All unite in appreciation of his unselfish and gentle nature, his patience and his forbearance and for the steadfastness with which he has held to his ideals through life. Such is the professor and student whom Technology is to lose as a teacher, but by no means as man. His life has been devoted to the institute, his laboratories are those which he has created within the school, and relieved of the drudgery that is inseparable from the lecture hall, he will be the freer to give to the world the benefits of long experience.

## A WAGON LOADER.

A useful machine for loading such material as coal from piles into wagons is shown in the accompanying illustration. This loader is manufactured by the Jeffrey Mfg. Co.





## PERSONAL AND GENERAL

Mr. J. B. Tyrrell, who has been visiting mining districts in British Columbia left Prince Rupert last week on his way to Treadwell. He will go to Calgary on his return from Treadwell.

Mr. C. D. Kaeding has been appointed vice-president and manager of Dome Mines Ltd.

Mr. J. Murray Clark, K.C., has gone to Edinburgh, Scotland, on professional business.

W. D. B. Motter, Jr., recently manager of the Canada Iron Mines, Limited, of Trenton, Ontario, was appointed on May 1st as manager of the Benson Mines Company, at Benson Mines, N. Y.

Mr. H. Bradley left Toronto for Calgary last week.

Mr. H. C. Meek has resigned his position as superintendent at the Dome Mine.

Mr. J. C. Murray left Toronto for Calgary last week.

Mr. J. W. Astley has been commissioned by the Provincial Department of Mines to examine and report on a number of mining properties on Texada and Valdes Islands, British Columbia.

Mr. T. Walter Beam, of Denver, Colorado, is again at Hedley, Similkameen, B.C., in the interests of the New York No. 2 Syndicate, which is doing much diamond-drilling near Hedley on a group of mineral claims held under option of purchase.

Messrs. O. E. Cary and W. E. Henry, of Denver, Colorado, each representing a zinc-purchasing company, have been visiting mines in Slokan district, British Columbia, with the object of buying zinc ores there.

Mr. S. H. Conner has returned from Philadelphia to the Lardo river, B.C., to resume work in connection with efforts to recover gold by dredging.

Mr. S. S. Fowler, of Riondel, B.C., general manager for the New Canadian Metal Co., Ltd., on June 16 left Nelson for San Francisco, California, on a business visit.

Mr. W. S. Hawley, of Spokane, Washington, managing director for the Silver Hoard Mines, Ltd., has been spending a week or two at the company's mine in Ainsworth Camp, B. C.

Mr. B. Wallis Knowles, of Hedley, B.C., with the Hedley Gold Mining Co., was married on June 1, at Keremeos, also in Similkameen district, to Miss Ellen Corrigan, of Hope, B.C.

Mr. Andrew G. Larson, of Vancouver, B.C., has been engaged by the Provincial Department of Mines, to examine and report on mining properties in Franklin Camp, north fork of Kettle river, in the northeastern part of Boundary district.

Mr. L. C. Mayer, of New York, consulting engineer for the company recently organized to acquire the mines and reduction works of the British Columbia Copper Co., has returned from a visit to the Boundary district, B.C., whence he went last month in company with the president of the company, Mr. Allen Rogers.

Mr. F. J. Murphy, formerly of Houghton, Michigan, is now assistant to Mr. J. P. McFadden, manager of the Surprise mine, near Cody, Slokan, B.C.

Mr. J. L. Retallack has returned to Kaslo, B.C., from a short visit to Spokane, Washington.

Mr. Wm. Rowe, superintendent of the Jewel Gold mine, in Boundary district, B.C., is convalescent after illness with cerebral hemorrhage.

Mr. F. M. Sylvester, general manager for the Granby Consolidated M. S. and P. Co., has returned to British Columbia from a visit to New York.

Mr. J. D. MacMaster, of Rochester, N.Y., managing director of the Queen's Head Mining and Milling Co., is directing work at the company's Hartney mine, near New Denver, B.C.

Mr. F. L. Smith, who for more than a year had been superintendent of the British Columbia Copper Co.'s Queen Victoria mine, near Nelson, B.C., is on a visit to relations at Burlington, Ontario.

Mr. J. J. Streit, superintendent of the John L. Retallack Co.'s mines near Whitewater, Slokan, B.C., has returned from Rochester, N.Y., whence he went to receive special surgical treatment. He is not yet strong enough to resume his mining work.

Mr. Wm. Thomlinson, of New Denver, B.C., is collecting ore samples from mines in the Skeena country, Cassiar district, B.C., for the Canadian exhibit to be made at the Panama Exposition at San Francisco in 1915.

Mr. G. B. Wilson, manager of the marble quarries at Marblehead, north of Kootenay lake, was married recently in the United States, and has returned to British Columbia with his bride.

The Sullivan Machinery Company announces that Mr. J. C. West, hitherto local manager at San Francisco, has been transferred to the general offices at Chicago, in the capacity of general sales engineer. Mr. Ray P. McGrath, for several years associated with the new England sales office of this company, at Boston, has been appointed district manager at San Francisco, to fill the vacancy.

Mr. F. R. Wolfe, of Spokane, Washington, manager for the Florence Mining Co., has been spending a few days at the company's Hope mine, near Ainsworth, B.C.

Mr. H. P. Dickinson, of Vancouver, general sales manager in British Columbia for the Giant Powder Co. Consolidated, was in the Kootenay district lately in connection with changes there, Mr. C. S. Cradock having been promoted to the position of special agent, with headquarters in Vancouver, and Mr. W. S. Rugh, for years office manager for the Le Roi Mining Co., at Rossland, succeeding Mr. Cradock as Interior general agent, with headquarters at Nelson. Mr. R. H. Ley, formerly practising assaying at Nelson, is now the company's resident agent for northern British Columbia, with Prince Rupert as his centre. All these officials are well known in mining districts in British Columbia.

### DR. ADAMS HONORED BY TUFTS COLLEGE.

At the recent Commencement of Tufts College, Winston Churchill and Dean Frank D. Adams of McGill University received honorary degrees. Incidentally, Dean Adams was the chief speaker at the annual dinner of the Association of Harvard Engineers and Dr. and Mrs. Adams were also the guests of the Greater Boston geologists at a brilliant dinner at the University club, at which twenty-seven were present.

While not so large as Harvard or Tech, Tufts has many well known men among its faculty and graduates. Among those of most interest to Canadian mining men is perhaps Dr. A. C. Lane, the well known geologist, one of the corresponding members of the Canadian Mining Institute.

One of the most successful graduates of Tufts is Dr. F. S. Pearson, who has been associated with Canadian and English capitalists in many hydro-electric enterprises.



## SPECIAL CORRESPONDENCE

### PORCUPINE AND KIRKLAND LAKE

**Hollinger.**—The factor of most importance to the whole of the Pearl Lake section of Porcupine camp, as well as the Hollinger, is the diamond drilling to depth on the Hollinger mine. The greatest care has been taken that the results from this work should not become known and it is not likely that any tabulated statement will be made for some time. But from many indications it is so generally surmised that the cores have given favorable indications that there is a still greater feeling of optimism in regard to the long life of the camp than at any previous period in its history.

Since the results of the diamond drilling became known to the members of the Canadian Mining and Finance, who control the Hollinger, there has been no stay in the pushing forward of the very extensive expenditure on plant and equipment. Every effort is being made to expedite the completion of the big power plant on Gillies lake, which will give the allied properties of the Canadian Mining and Finance syndicate all the power needed for some time. At the same time there is no immediate intention of building another and a larger mill. The addition of twenty stamps to the present mill will be completed without any undue haste and further additions will be made to the present mill as the increased tonnage requires.

The four weekly report ending May 19th shows that gross profits were about the same, total costs perceptibly lower than any previous month and that the net surplus is gradually mounting.

The mill ran 94 per cent. of the possible running time, treating 18,200 tons, of which 831 tons were treated for the Acme Gold Mines. The average value of Hollinger ore treated was \$13.10 per ton, approximate extraction 95.7 per cent.

**The Dome Lake** is having very good fortune at the 300 ft. level. It was not anticipated that they would run into their ore shoot until 150 ft. had been drilled, but as a matter of fact good ore was encountered a little less than 50 ft. from the shaft and 50 ft. of it has been opened up already. About the middle of the month there was 5 ft. of ore of a better grade, considering width, than at any level in the mine, and for the whole of the 50 ft. the stope can be carried right across the drift, giving an average grade of between \$15 and \$20. The compressor is now being driven by electricity and is working very smoothly. The rule at this mine is a round a shift with the new Leyner drill.

**McIntyre.**—Following the closing of the New York office and other overhead expenses, the McIntyre Porcupine Gold Mines has decided to instal the continuous decantation process at their present mill and so rearrange the present equipment that it will add 150 tons daily to the capacity, giving, when the plans are complete, 300 tons a day. The manager, Mr. Ennis, wishes to raise the capacity of his mill so that he will be able to get down the cost per ton, which to date does not permit of treating the lower grade ore mined, at a substantial profit. The May report of the McIntyre shows that 4,480 tons was treated, giving an average mill head of \$11.10 per ton. The production amounted to \$47,184. The station has been cut at the 500 ft. level at the No. 4 shaft, and the campaign of development laid out is being rigidly adhered to.

**Dome.**—The result of operations at the Dome mines for May was 16,180 tons milled, \$62,109 gold recover-

ed. The low amount of production, in spite of the increase in tonnage treated is explained by the fact that the heads in gold recovered only ran \$3.83 to the ton.

Eighty stamps are now dropping at the Dome night and day, but the plates in the addition have only just been installed, and until the extra tube mill is running it will not be possible to raise the tonnage very materially. This should be a matter of only a few days now, however. All those who have come in contact with Mr. H. C. Meek, who has been manager of the Dome for the past four years, will learn with extreme regret that he has severed his connection with the company. He arrived at the Dome and took charge when it was merely a spectacular surface showing, and he has been in charge until now, when an eighty stamp mill is running and it has assumed large industrial proportions. In his place is Mr. C. D. Kaeding, who left the Copper Cliff staff to come to the Dome. He has been appointed general manager and managing director. He comes to the Dome with a great reputation for efficiency and his record in many camps will be reassuring to shareholders. He has already taken charge. Mr. Meek left South Porcupine on the 18th. His family goes to live in California, where he will join them after he has spent some time in the East.

**Three Nations.**—Mr. Laurendeau and his associates in the Hughes Porcupine discharged their underground miners on the Three Nations while a ten day mill run was made. They have had an option on the Three Nations for the past two or three months.

**Vipond.**—Concrete work on the foundations of the addition to the Vipond mill has been completed, excellent progress having been made since Mr. C. H. Poirier took charge once more. Underground work at the mine should commence very soon.

### COBALT, SOUTH LORRAIN, ELK LAKE AND GOWGANDA

**The Bailey Cobalt Mines Ltd.** has made an assignment. This action was anticipated some weeks ago when under orders from the President Mr. E. F. Benson, all underground men were laid off and development ceased. It is understood that practically the sole creditor is Mr. E. F. Benson, who has been advancing the company money for the past three years. The sum that he is now owed by the company amounts to about \$90,000. Last year when the Bailey was producing well, Mr. Benson liquidated some of his debt by taking the proceeds from the cars of ore but it was early recognized this year that the only possible way to make a success of the mine was to carry out an expensive scheme of development and Mr. Benson was not prepared to advance any further money for the purpose.

The mine as shown in the annual report has practically no ore reserves, but operations at the 300 ft. level have opened up some ore which would appear to give good hopes for future development.

**Casey.**—There is considerable activity on the Casey Cobalt range apart from the main operators, the Rose van Cutsen group. The Trethewey Cobalt now has a diamond drill at work on some claims with the hope of discovering favorable conditions for sinking and perhaps of cutting an ore body. On the north half of lot 7, section 5 on the Casey Mountain ridge a number of



men are stripping and trenching and it is understood that the Casey Mountain will start operations again soon.

**Nipissing.**—During May Nipissing mined ore of an estimated net value of \$211,256.

Two new branch veins were found during the month in the Meyer workings. Each has a width of from one to two inches and assays about 1,800 oz. There are now four branch veins being developed by drifts.

The main vein has now been drifted upon for 540 ft. and is being prepared for stoping at the fourth level. The stope can be profitably mined for a width of 12 ft. thus yielding a large tonnage of low grade for the mill.

The hydraulic pump has been moved from the Cobalt Lake basin to Peterson Lake and is now engaged in washing the overburden from R L 486.

The high grade mill treated 183 tons and shipped 523,320 oz. of silver from Nipissing and customs ore. The low grade mill treated 6,560 tons.

637,889 oz., surplus \$352,810 and ore reserves 2,060,625 oz.

Mr. T. R. Jones, general manager states "the reserves from development of ore during the year are approximately 54,116 tons of a value of about 25 oz. to the ton or 1,352,900 oz. In addition there are approximately 28,309 tons of ore broken in the stopes of about equal value of 707,725 oz."

In addition there are 200,000 tons of sand tailings containing a little more than a million ounces. A small plant has been erected upon the property where tests have been so satisfactory that it has almost been established that they can be treated at a good profit.

The very extensive scheme of development carried on in the search for new ore bodies has been partly successful. Mr. Chas. L. Denison says in this respect "Superintendent Jones' estimate of ore reserves is that they are at least sufficient to supply the mill the coming year. The exploration work has been satisfactory



Power plant of the Acadia Coal Co., Stellarton, Nova Scotia.

**Beaver.**—In the last quarterly report of the Beaver Consolidated Mr. F. L. Culver, president, makes the following interesting statement: "We have already commenced sinking the shaft below the 800 ft. level. The object will be to get through the diabase sill and penetrate the Keewatin rock which lies underneath as it is believed that greater values exist below the sill than above." The financial position of the Beaver on May 31st was:

Cash balance .....	\$47,518.93
Due from smelters .....	71,299.40
Ore bagged at mine and in transit	17,844.77
	<hr/>
	\$136,663.09
Less accounts payable .....	13,214.62
	<hr/>
Available balance .....	\$123,448.47

**The York Ontario** intend to start operations as soon as a new compressor can be installed and power obtained from the power company. The capitalization has been increased from \$1,000,000 to \$1,500,000 and a new board of directors elected. Development will be continued on the upper levels and the shaft taken down to 1,000 ft. and the mill put in shape for crushing ore.

**Buffalo.**—The annual report of the Buffalo Mines, which has just been issued shows a production of 1,

and gives considerable assurance of developing ore ahead of requirements."

The most important discovery is the locating of No. 12 vein on the lower levels. Mr. Denison states "considerable assurance is felt for the future considering what the exploration work has shown and ore likely to be further developed."

**Chambers-Ferland.**—The bylaw authorizing the transfer of the entire stock and assets of the Chambers-Ferland company for 115,00 £5 shares of the Alladin Cobalt mining company was not passed at the adjourned meeting of the Chambers-Ferland in Cobalt and will come up again at the meeting of the company which will be held in London. Minority shareholders, who were again represented by Mr. Harry Cecil and Mr. A. A. Amos strenuously opposed the deal.

Both these gentlemen gave notice that under the amendment to the companies act they would enter action restraining the company from carrying the deal through.

**Hollinger.**—General manager P. A. Robbin's report for the four weeks ending May 20, 1914, shows a gross profit of \$123,087.67. \$13,221 was spent on plant. There was hoisted 14,603 tons of ore which had an average value of \$13.10. Mining costs per ton of ore milled amounted to \$2.17. Total cost per ton was \$4.22. The



mill ran 94 per cent. of the possible running time, treating 15,200 tons, of which 831 tons was treated for the Acme Gold Mines, Limited. Approximate extraction was 95.7 per cent. Milling costs were \$1.145 per ton.

## NOVA SCOTIA

**Dominion Coal Outputs.**—To the middle of June the Dominion Coal Company's outputs show an increase of 45,000 tons over the first half of June 1913. For the week ending the 13th a production of 117,000 tons was obtained, and shipments totalling over 145,000 tons were made from the Glace Bay mines, a really notable achievement. The daily outputs for nine days maintained such a sustained high level that it is worth while to give them in detail, as follows:



Some of the members and guests at the annual meeting of the Mining Society of Nova Scotia, Sydney, N.S.

June 4, 19,368 tons; June 5, 19,117 tons; June 6, 8,944 tons; June 8, 19,888 tons; June 9, 19,824 tons; June 10, 20,692 tons; June 11, 19,649 tons; June 12, 19,448 tons; June 13, 17,463 tons.

The reduction on the 8th was caused by a shortage of vessels, occasioned by weather conditions, only about half the mines being at work. For the first time the production crossed the 20,000 tons mark, and, as will be seen, the new record of 20,692 tons was not a chance occurrence, but was obtained in the midst of the largest series of daily outputs yet put out by the company's collieries.

On the 10th inst. the Springhill collieries produced 1,610 tons, making a total production for that day of 22,302 tons.

The shipments from Sydney averaged over 24,000 tons daily throughout the week, and on one day reached the extremely high figure of 28,312 tons. Twenty-two large cargoes were despatched during this week, one cargo exceeding 11,800 tons and another cargo exceeding 10,000 tons, and in addition to this were numerous bunker-boats and schooners, sometimes termed "chicken-feed," but aggregating a respectable tonnage nevertheless.

## BRITISH COLUMBIA

After a late spring, with frequent rains, summer weather is being experienced in the Interior mining camps, and mining is generally progressive, though the "mining boom" predicted by those not familiar with conditions is not yet in evidence.

### East Kootenay.

During four weeks ended May 28, shipments of lead-silver ore from the Sullivan Group mines, near Marysville, to the Consolidated Mining and Smelting Co.'s smelting works at Trail, totalled 1,215 tons. There are in these mines large bodies of lead-zinc ore, but these are not being mined for the reason that a suitable separation process is not yet available, so this class of ore is left in the mines, in which also occurs much lead ore that is mined and shipped to the smeltery.

A small output of lead-ore is being maintained at the St. Eugene mine, and prospecting for other ore shoots is being continued. Other properties in this neighborhood on which lead ore has also been found are the Society Girl, situated on the same side of Moyie lake as the St. Eugene group, and the Aurora, directly across the lake from the latter mine. No work has been done on the Aurora for a year or more, but prospecting is being done on the Society Girl property, on which ore has been found and mined in past years.

### West Kootenay.

#### Whitewater.

The Echo, above the Jackson mine, in Jackson basin, is again being worked, after having been idle a long time.

Leasers, who have already shipped three cars of high-grade zinc ore from the U. S. mine, in Jackson basin, are now busy taking out more ore.

The dump at the Wellington mine, a mile or so from Whitewater, is being worked under lease. Much fine galena is in the dump, and this is being recovered by hand-jigging.

Work has been resumed at the John L. Retallack & Co. mines, near Whitewater, after several weeks' sus-



pension while melting snow made the workings very wet through seepage of water into them.

Now that supplies can be got to the Eagle Mountain Mining Co.'s Eureka mine, four miles from Sproules, a stopping place on the Kaslo & Slocan railway, the contractors for driving an adit have resumed work, with about 300 ft. to be driven to complete their contract.

Sufficient dry silver ore to fill two railway cars, extracted during the winter months from the Panama mine, situated high up the mountain above Bear lake, is ready for the pack train, which will take it down to the railway as soon as the trail shall be hard enough for the pack animals to travel over it.

#### Slocan.

The Slocan Star Mines, Ltd., is again operating its concentrating mill, which had been idle for seven or eight years. This mill was remodelled in 1904 so as to provide for recovery of the zinc as well as the lead contained in the ore, approximately \$40,000 having been at that time expended on improvements and additions to plant and machinery. In eight years, 1896-1905, concentrates of a gross value of \$1,383,702—silver-lead \$1,229,641 and zinc \$154,061—were shipped from this mill by the Byron N. White Co. of Milwaukee, Wisconsin. During several later years the mill was unworked and little was done in the mine, owing to long-drawn-out litigation over extra-lateral rights. In the latter part of 1911 a settlement was made and the properties affected were merged, and acquired by the Slocan Star Mines, Ltd., which has since done much development work at greater depth than previously had been reached. Now, in addition to occasional shoots of clean ore, suitable for shipment in its crude state to the smelter, there is enough milling ore opened to keep the concentrating mill supplied for a comparatively long period. It is intended to make both silver-lead and silver-zinc concentrates.

Negotiations are being carried on with a view to using for a while at the Standard Silver-Lead Co.'s concentrator near Silverton, the experimental unit of the Minerals Separation flotation process plant for some time past in use at the mill, on Four-mile creek, of the Silverton Mines, Ltd. At the latter company's mill arrangements are being made to put in two or three more concentrating tables, the crushing capacity of the present plant being about 50 tons a day greater than its tabling capacity. Confidence is felt that the Minerals Separation process will be found successful in saving most of the silver and the zinc that ordinary water-concentration will not recover. Similarly, the Standard Co. hopes to use the process and by it save much of the 8 to 10 oz. of silver now being lost in the slimes, and, as well, to make a higher recovery of zinc.

Developments in levels of the Standard mine above No. 5 adit have led to more work being undertaken in Nos. 4 and 3. A brief review of conditions in the mine early in June is as follows: No. 3 adit was being extended to ascertain whether an ore shoot opened on No. 4, 100 ft. below, continues up to the level of No. 3. Some zinc ore was in the face of the drift, but it was estimated that from 100 to 150 ft. more would have to be driven to reach the silver-lead ore if the shoot extends that high in this part of the mine. On No. 4 the drift had been in ore for 150 ft., but zinc was appearing in the face. This ore shoot was about 40 ft. in width at its widest part, most of it ore suitable for either shipping crude or milling, though some barren ledge matter occurred in places. A raise was being put up from No. 5 to the big ore shoot in No. 4, a dis-

tance of 125 ft. There are large bodies of ore on and above No. 5 not yet taken out. Stopes from No. 6 level were still yielding ore. No. 7 was in about 3,500 ft. with an estimated distance of 600 ft. yet to be driven to get under an ore zone that in No. 6 was very productive. Two ore shoots have been passed through on this level, but these are not being worked yet, the intention being to defer opening them until after exploration of the ground ahead of the present face of the adit. No. 8 was in about 1,000 ft. and had passed through zinc ore but no silver-lead. There is a prospect of lead ore being found at 200 to 300 ft. farther in, for this drift will at 1,300 ft. from its portal be under ground that is ore-bearing on No. 7, but the vertical distance between these two levels is too great to allow of full confidence being felt that this will be realized. However, the drift is to be extended to three or four times its present length, so that exploration may be carried on at that depth under parts of the mine that above No. 6 have yielded a large quantity of good ore. Ore bins have been constructed below the portal of No. 7 and a loading station and tramway loader are being put in, connection being made here with the main aerial tramway, the upper terminal of which is below the portal of No. 6. Notwithstanding that a considerable output has been regularly maintained for more than two years, the Standard mine is to-day in excellent condition for production, with large ore reserves opened and reasonable expectation of finding new ore shoots as development shall be farther advanced.

#### Nelson Division.

Prospects are favorable for increased activity at several mining properties in the neighborhood of Ymir. Much underground development has been done during the last two years at the Ymir-Wilcox, Dundee, and Yankee Girl mines, besides which prospecting on a number of mineral claims has encouraged the holders to continue work. Among the latter are the Jennie Bell, on which Mr. J. J. Hennessy, the lessee, is driving a 200-ft. adit; the Stirling, owned by Phil White, of Vancouver; and the Canadian Pacific, owned by Mr. Ed. Peters, of Nelson, and associates.

The Ymir-Wilcox Development Co., with headquarters at Evanston, Illinois, holds a group of 5 mineral claims, mill site, and tract of timber, situated 7 to 8 miles from Ymir, up the south fork of Wild Horse creek. For two years the work of exploring the ore deposits in the lower levels of the mine, has been in progress under the direction of Mr. Arthur Lakes, Jr., formerly of Denver, Colorado. The chief object in view has been the opening of the mine so that the ore bodies may be handled more economically and effectively, and the general improvement of working conditions and facilities. Ore shoots have been opened to 400 ft. greater depth than under previous ownership. Three more adits have been driven, several intermediate levels opened, and connections made between the various workings by means of shafts and raises. The ore-body gives an average of 30 inches of dry silicious ore, generally quartz with 10 to 15 per cent. sulphide. Sufficient ore has been developed to ensure a continuous supply for the 10-stamp mill that was erected some years ago and which is about 800 ft. lower down the mountain-side than the portal of the lowest adit yet driven on the property. The work of the early future will include the improvement of milling facilities in regard to concentration and cyaniding, so as to provide for gold-



saving by amalgamation, concentration, and cyaniding, the ore having been found amenable to that treatment. As yet the Ymir-Wileox company has not done much crushing at its mill, but the increase of power is under consideration, with a view to continuous production. The mill plant, compressor, and electric generator have been run by water-power; it is intended to develop the larger power available from the south fork of Wild Horse creek and so make ample provision for requirements of both mine and mill when operations shall be on an extended scale. There is now a transmission line from mill to the compressor in the mine, for power uses, and to mine buildings for lighting purposes. Ore transportation from mine to mill is over aerial tramways, of which there are two. The total value of production by previous owners is estimated at approximately \$90,000; ore now available for extraction is estimated to be of a gross value several times greater than that amount. On an average, 12 men have been employed at this mine; with the operation of the mill and the stoping of ore for milling the working force will be proportionately increased.

The prospective development of the Molybdenite group of mineral claims, situated on the northwestern slope of Lost or Stag-leap mountain, above Lost creek, at a distance by wagon-road and trail of about 15 miles from the town of Salmo, in Nelson mining division, has during recent months attracted much attention throughout the district. There are 7 claims in the group, and the owners Messrs. J. Benson and S. N. Ross of Salmo, and H. Bennett of Nelson, have uncovered molybdenite ore in a number of open cuts along a distance of 1,200 ft., the ore having been traced that distance from well down one side of the mountain, some 600 ft. above Lost creek, up over a shoulder of the mountain and down the northeastern slope. The old Dewdney trail, constructed in the sixties of last century, passes nearby, and considerable development work was done in this neighborhood about 20 years ago, the prospectors of those days having seemingly been in search of gold ore under iron cappings. New York men, stated to be acting for German principals, are negotiating for a bond on this molybdenite property, on which in the largest opening there is a good showing of the metal, in places of high-grade ore and, with as well the metal freely disseminated throughout rock to a width of 8 ft. The formation in which the ore occurs in approximately 600 ft. wide and specks of the molybdenite may be seen in the rock right across that width, but so far the ore of commercial value has been found only within the restricted limits first above-mentioned. Under the terms of the bond that the owners have agreed to give, a minimum expenditure of \$1,000 a month on development is to be made. Upon acceptance of the bond, those seeking to acquire the property will be required to commence development work without delay.

Last autumn some prospectors found oxidized copper ore and chalcopyrite on Brushy mountain, six miles south of Salmo. The season was then too far advanced for them to do much work on the showing, but as soon as the snow was off the ground in the spring they packed up supplies and are now prospecting the ground.

Another 4-horse team has been obtained for hauling carbonate of lead ore from the H. B. mine, on Deer creek, to Salmo railway station, for shipment thence to the smelting works at Trail. Beyond the H. B., higher up Deer creek, lead ore occurs on the Aspen, a mineral claim on which about \$10,000 has already been spent by Mr. H. M. Billings and partners.

### SILVER HOARD MINE, AINSWORTH, B. C.

The Silver Hoard mining company operating near Ainsworth, B. C., is putting in additional plant and preparing to mine and ship ore steadily from its mine situated within four miles from the steamer landing at the Highland mill, near Ainsworth. Cement-concrete foundations are in for an Ingersoll-Rand compressor to have a capacity of 327 cu. ft. of air per min. to be driven by a Canadian General Electric 2,200 volt induction motor. A Jenckes Machine Co.'s 6 x 8 double-cylinder single-drum hoist has already been installed. The machinery will be in use before the end of June. Electric current for operating the compressor will be obtained from the Consolidated Mining and Smelting Co.'s Highland mill, where power is generated for running the machinery of that company's No. 1 mine, situated within three-quarters of a mile of the Silver Hoard. A three-phase transmission line has been constructed from the No. 1 to the Silver Hoard mine, and a telephone wire is strung on the poles of that line. Current for electric lighting of all mine buildings at the Silver Hoard has already been arranged for.

Development work has been continued all through the winter in the Silver Hoard. Forty cars of ore—approximately 1,400 tons—has been mined from on and above the 100-ft. level, chiefly in the course of development. This ore is stated to have averaged 46.7 oz. silver to the ton, 4 per cent. lead, and 9 per cent. zinc. Milling ore mined in addition to that suitable for shipping crude to the smelter is stored on the dumps awaiting the provision of concentrating facilities. Ore is hauled in wagons to the head of the No. 1 mine aerial tramway and conveyed thence over the tram down to the shipping bins at the lakeside.

Development work is being continued on No. 1 level, by drifting north and south on the big lead occurring here. Similar work is in progress on the 200-ft. level, and the lode is being crosscut as well. Some 53 ft. has already been crosscut without the limits of the orebody having been reached. There are in this big lode three separate shoots of ore of shipping grade—one on the footwall side, a second shoot about 30 ft. from the footwall and a third on the hangingwall side. The last-mentioned varies in width from 2 to 4 ft. The centre shoot is of carbonate ore, while the others are sulphide in a gangue chiefly of quartz. It is not yet intended to open stopes, but to restrict shipments to ore taken out in the course of development.

Ore cars of 16 cu. ft. capacity will be run in the incline shaft on a track with 10-lb. rails. Steel of similar weight is to be laid in main drifts and crosscuts, while in laterals, 12 or 8-lb. will be used. Fifteen men are employed and when the plant is installed two shifts will be worked. It is planned to continue development down to the 600-ft. level, on the slope of the mountain below which is the mill-site, so that all ore will be dropped down on a gravity system.

There are five mineral claims in the Silver Hoard group, all surveyed, and comprising 205 acres, parts of the property are heavily timbered with fine trees—fir, cedar, tamarack, white pine, hemlock, and spruce. A sawmill has been put in to cut lumber for mine buildings and timbering; its capacity is 5000 ft. a day. Buildings are substantially constructed and provide accommodation for 40 men; they include superintendent's cabin, mine and assay offices, bunk and boarding houses, barn, etc. All are lighted by electricity and are supplied with running water. The north fork of Cedar creek crosses the property; its minimum flow is estimated at about 100 h. p.

## MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg.,  
Toronto, Ont.)

June 23, 1914.

## New York Curb.

	Bid.	Ask.
American Marconi .....	3.25	3.75
Alaska Gold .....	26.62	26.87
British Copper .....	1.62	2.00
Braden Copper .....	7.62	7.87
California Oil .....	322.00	324.00
Chino Copper .....	41.00	41.25
Giroux Copper .....	.50	1.00
Green Can. ....	31.50	33.00
Miami Copper .....	21.87	22.12
Granby. . . . .	....	....
Nevada Copper .....	13.87	14.00
Ohio Oil .....	174.00	175.00
Ray Cons. Copper .....	20.75	21.00
Standard Oil of N. Y. ....	....	....
Standard Oil of N. J. ....	....	....
Standard Oil (old) .....	138.00	....
Standard Oil (subs) .....	980.00	....
Tonopah Mining .....	6.75	7.00
Tonopah Belmont .....	6.75	6.81
Tonopah Merger .....	.44	.46
Inspiration Copper .....	17.50	17.75
Goldfield Cons. ....	1.37	1.50
Yukon Gold .....	2.50	2.75

## Porcupine Stocks.

	Bid.	Ask.
Apex. . . . .	.01½	.02½
Dome Extension .....	.07¼	.07½
Dome Lake .....	.37	.39
Dome Mines .....	8.20	8.40
Eldorado. . . . .	....	....
Foley O'Brien .....	.27	.28
Hollinger. . . . .	18.75	19.00
Jupiter. . . . .	.05	.06
McIntyre. . . . .	.25	.26
Moneta. . . . .	....	.04
North Dome .....	....	.05
Northern Exploration .....	2.00	2.60
Pearl Lake .....	.03	.03¼
Plenaurum. . . . .	....	.50
Porcupine Vipond .....	.27	.28
Imperial. . . . .	.01	.01½
Porcupine Reserve .....	....	....
Preston East Dome .....	.01	.01½
Rea. . . . .	.10	.20
Standard. . . . .	....	....
Swastika. . . . .	.01	.01¼
United. . . . .	....	....
West Dome .....	.05	.10
Porcupine Crown .....	.85	1.00

## Cobalt Stocks.

	Bid.	Ask.
Bailey. . . . .	.06¾	.01
Beaver. . . . .	.30	.30½
Buffalo . . . . .	.80	1.00
Canadian. . . . .	.08	.10
Chambers Ferland .....	.17½	.18½
City of Cobalt .....	.40	.45
Cobalt Lake .....	.37	.45
Coniagas. . . . .	7.00	7.40
Crown Reserve .....	1.01	1.04
Foster. . . . .	.04	.06

Gifford. . . . .	.01	.02
Gould. . . . .	.01	.01½
Great Northern .....	.06½	.08
Hargraves. . . . .	.01	.02
Hudson Bay .....	65.00	70.00
Kerr Lake .....	5.00	5.10
La Rose .....	1.42	1.44
McKinley. . . . .	.63	.68
Nipissing. . . . .	6.35	6.45
Peterson Lake .....	.33½	.34
Right of Way .....	.02	.03
Rochester. . . . .	....	....
Leaf. . . . .	....	....
Cochrane. . . . .	....	....
Silver Queen .....	....	....
Timiskaming. . . . .	.13½	.14
Trethewey. . . . .	.20	.23
Wettlaufer. . . . .	.05½	.06½
Seneca Superior .....	2.50	2.70

## TORONTO MARKETS.

June 24—(Quotations from Canada Metal Co., Toronto).

Spelter, 5¼ cents per lb.
Lead, 5¼ cents per lb.
Tin, 33½ cents per lb.
Antimony, 8½ cents per lb.
Copper, casting, 15 cents per lb.
Electrolytic, 15 cents per lb.
Ingot brass, yellow 12c., red 13 cents per lb.

June 24—Coal—(Quotations from Elias Rogers Co., Toronto).

Anthracite, \$7.50 per ton.
Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

June 22—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, \$1.75 to \$1.80 per ton.
Foundry coke, prompt, \$2.35 to \$2.50 per ton.

June 22—Tin, straits, 30.65 cents.

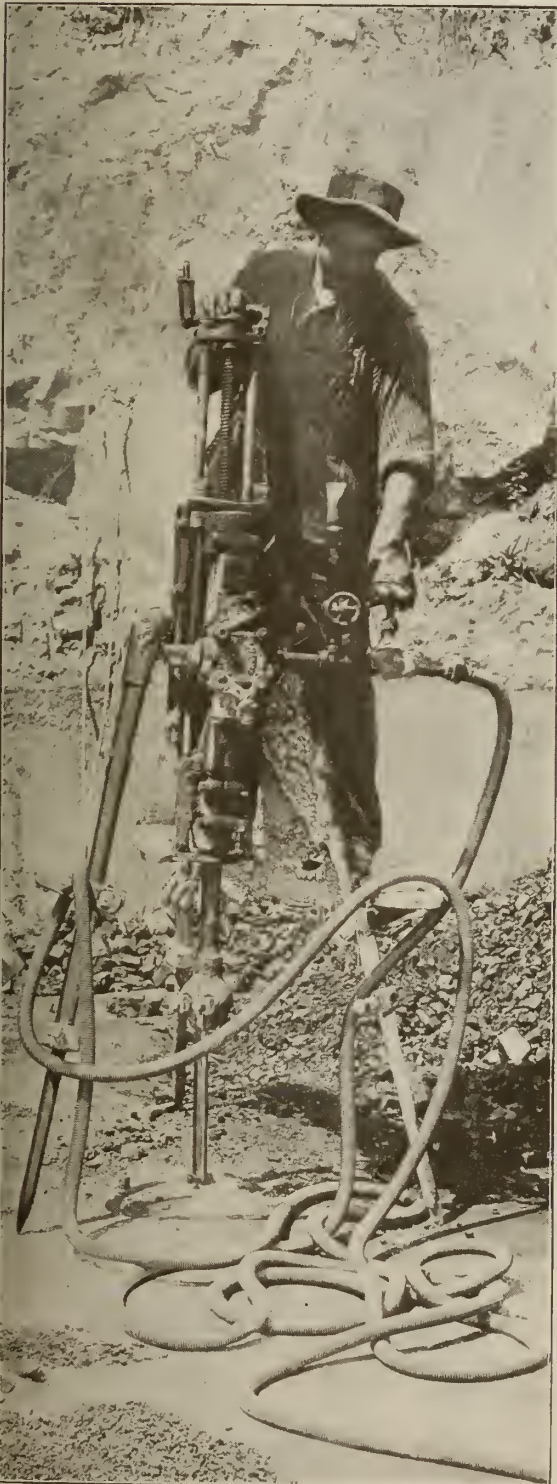
Copper, Prime Lake, 14.00 to 14.25 cents.
Electrolytic copper, 13.70 to 13.80 cents.
Copper wire, 14.75 cents.
Lead, 3.90 cents.
Spelter, 5.05 to 5.15 cents.
Sheet zinc (f.o.b. smelter), 7.00 cents.
Antimony, Cookson's, 7.10 to 7.20 cents.
Aluminum, 17.75 to 18.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, \$43.00 to \$44.00 per ounce.
Platinum, hard, 10 per cent., \$46.00 to \$47.50 per ounce.
Platinum, hard, 20 per cent., \$49.00 to \$51.50 per ounce.
Bismuth, \$1.95 to \$2.15 per pound.
Quicksilver, \$38.00 per 75 lb. flask.

## SILVER PRICES.

		New York	London
		cents.	pence.
June 11 .....		56⅞	26⅞
" 12 .....		57¼	26¼
" 13 .....		56¾	26⅞
" 15 .....		56½	25⅞
" 16 .....		56½	25⅞
" 17 .....		56½	25⅞
" 18 .....		56¾	25⅞
" 19 .....		55⅞	25⅞
" 20 .....		55⅞	25⅞
" 22 .....		56½	26
" 23 .....		56⅞	25⅞



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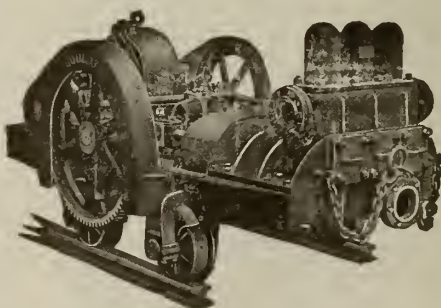


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Canada's Departmental House for Mechanical Goods



# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

<b>Dominion of Canada.</b> <b>Ontario</b> Astley, J. W. Cohen, S. W. Campbell & Deyell. Carter, W. E. H. Evans, J. W. Ferrier, W. F. Forbes, D. L. H. Graham, S. N.	Gwillim, J. C. Handley, John. Hassan, A. A. Haultain, H. E. T. Hille, F. Loring, F. C. McEvoy, Jas. Scott, G. S. Segsworth, Walter E. Smith, Alex H.	Smith, Sydney. Maurice W. Summerhayes. Tyrrell, J. B.  <b>Quebec</b> Burchell, Geo. B. Cohen, S. W. DePencier, H. P. Hardman, J. E. Hersey, Milton L. Johnson, W. S.	Smith, W. H. Ross, J. G.  <b>British Columbia</b> Brown & Butters. Fowler, S. S.  <b>FOREIGN-New York</b> Canadian Mining & Exploration Co., Ltd. Colvocoresses, Geo. M. Dorr, Jno. V.N. Hassan, A. A.
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## ASSAYERS, CHEMISTS AND ORE TESTERS.

<b>Dominion of Canada</b> <b>Ontario</b> Belleville Assay Office. Campbell & Deyell Heys, Thos. & Son	Canadian Laboratories, Ltd.  <b>Quebec</b> Hersey, Milton Co., Ltd	Dr. J. T. Donald	<b>Foreign-New York</b> Ledoux & Co.
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## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

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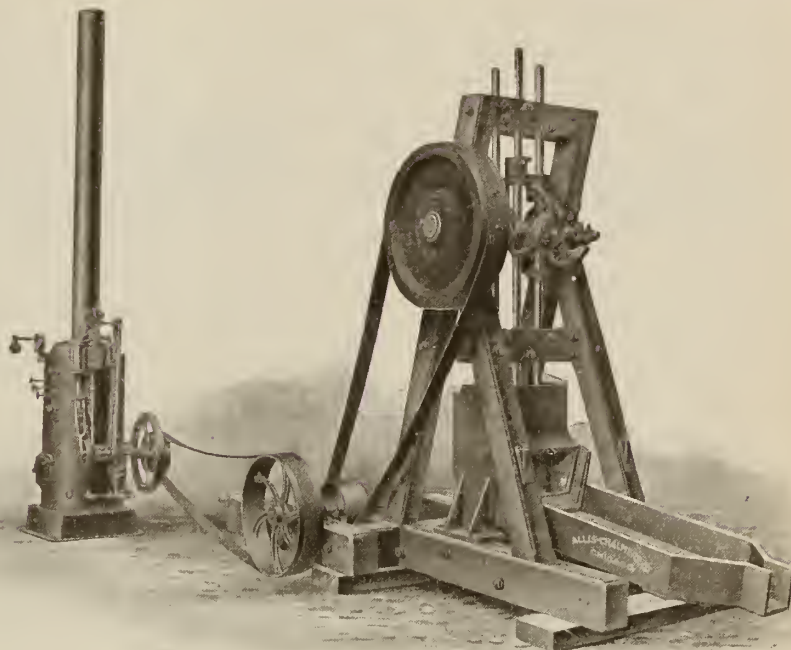
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Cyanide 98/99 per cent.

Cyanide of Sodium 128/130 per cent.

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# The Canadian Miner's Buying Directory.

## Air Hoists—

The Herbert Morris Crane & Hoist Co., Ltd.  
Jenckes Machine Co., Ltd.  
Canadian Ingersoll-Rand Co., Ltd.

## Amalgamators—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Northern Canada Supply Co.

## Assayers and Chemists—

Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York

Thos. Heys & Son.

## Assayers' and Chemists' Supplies—

C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lyman's, Ltd., Montreal, Que.  
Stanley, W. F. & Co., Ltd.  
Peacock Bros.  
Geo. Taylor Hardware Co., Ltd.

## Bags—

Smart-Woods, Ltd.

## Ball Mills—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
The John Inglis Co., Ltd.

## Beams—Steel—

Canadian Allis-Chalmers, Ltd.  
Dominion Bridge Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.

## Belt—

Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Jones & Glassco  
Canadian Fairbanks-Morse  
Federal Engineering Co.,  
G. Taylor Hardware Co., Ltd.

## Blasting Batteries and Supplies—

Canadian Allis-Chalmers, Ltd.  
Thomas & William Smith  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada), Limited.  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Blowers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Boilers—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Waterous Engine Works Co.  
Canadian Fairbanks-Morse Co., Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
The John Inglis Co., Ltd.

## Buckets—

Rock & Power Mach'y, Ltd.  
Peacock Bros.  
M. Beatty & Sons, Ltd.  
Waterous Engine Works.  
Mussens, Ltd.  
Northern Canada Supply Co.

## Buildings—Steel Frame—

Dominion Bridge Co.  
Canadian Allis-Chalmers, Ltd.

## Cable—Aerial and Under-ground—

G. Taylor Hardware Co., Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

## Cableways—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Cages—

Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Jenckes Machine Co., Ltd.

## Cables—Wire—

Northern Electric Co., Ltd.  
Standard Underground Cable Co. of Canada, Ltd.  
Siemens Co. of Canada, Ltd.

## Canvas—

Smart-Woods, Ltd.  
G. Taylor Hardware Co., Ltd.

## Cars—

Jeffrey Mfg. Co.  
Mussens, Ltd.  
Northern Canada Supply Co.

## Cement Machinery—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Jenckes Machine Co., Ltd.  
Northern Canada Supply Co.  
Peacock Bros.

## Chains—

Jeffrey Mfg. Co.  
Peacock Bros.  
Jones & Glassco  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co.

B. Greening Wire Co., Ltd.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.

## Chain Crane—

The Herbert Morris Crane & Hoist Co., Ltd.

## Chain Blocks—

The Herbert Morris Crane & Hoist Co., Ltd.

## Chain Clutches—

The Herbert Morris Crane & Hoist Co., Ltd.

## Chemists—

Canadian Laboratories.  
Campbell & Deyell  
Thos. Heys & Son  
Milton Hersey Co.  
Ledoux & Co.

## Coal—

Dominion Coal Co.  
Nova Scotia Steel & Coal Co.

## Coal Cutters—

Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.

## Coal Handling Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Coal Mining Explosives—

Curtis & Harvey (Can.), Ltd.

## Coal Mining Machinery—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Jeffrey Mfg. Co.

## Coal Punctures—

Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.

## Coal Washeries—

Jeffrey Mfg. Co.  
Mussens, Ltd.  
Peacock Bros.

## Compressors—Air—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Canadian Allis-Chalmers, Ltd.  
Laurie & Lamb  
Canadian Westinghouse  
Can. Ingersoll-Rand Co. Ltd.  
Cleveland Pneumatic Tool Co. of Canada, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

## Concentrators and Jigs—

Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
James Ore Concentrator Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Fairbanks-Morse  
Jenckes Machine Co., Ltd.

## Concrete Mixers—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Condensers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.,  
Peacock Bros.

Laurie & Lamb  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

## Converters—

Canadian Westinghouse  
Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.

Krupp, Fried. A. G., Germany  
Mussens, Ltd.

Waterous Engine Works

## Conveying Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
M. Beatty & Sons, Ltd.  
Krupp, Fried. A. G., Germany

## Cranes—Electric—

The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—Overhead Traveling—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Crane Ropes—

Allan, Whyte & Co.  
Thos. & Wm. Smith  
B. Greening Wire Co., Ltd.  
G. Taylor Hardware Co., Ltd.

## Cranes—Swing Jib—

The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—Wall—

The Herbert Morris Crane & Hoist Co., Ltd.

## Crushers—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Peacock Bros.

Lyman's, Ltd.

Can. Fairbanks-Morse Co.

Mussens, Ltd.

Hadfield's Steel Foundry Co.

## Cyanide Plants—

Jenckes Machine Co., Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Roessler & Hasslacher  
Thos. & Wm. Smith  
Peacock Bros.

## Derricks—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Diamond Drill Contractors—

Diamond Drill Contracting Co.  
Smith & Travers.

## Dredging Machinery—

Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.

## Dredging Ropes—

Allan, Whyte & Co.  
Fraser & Chalmers, Ltd.  
B. Greening Wire Co., Ltd.

## Drills, Air and Hammer—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Drills—Core—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.

## Drills—Diamond—

American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.

## Drill Steel Sharpeners—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

## Drills—Electric—

Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Siemens Co. of Canada, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

## Dump Cars—

Sullivan Machinery Co.  
Waterous Engine Works Co.  
Mussens, Ltd.

Krupp, Fried. A. G., Germany  
Mussens, Ltd.

Siemens Co. of Canada, Ltd.

## Conveyors—Belt—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.

## Dynamite—

Curtis & Harvey (Canada), Ltd.  
Canadian Explosives  
Northern Canada Supply Co.

## Dynamos—

Can. Westinghouse Co.  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Siemens Co. of Canada, Ltd.

## Electric Cranes—

The Herbert Morris Crane & Hoist Co., Ltd.

## Elevating and Conveying Machinery—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Ejectors—

Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Elevators—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Krupp, Fried. A. G., Germany  
M. Beatty & Sons

Sullivan Machinery Co.

Northern Canada Supply Co.

Waterous Engine Works.

Can. Fairbanks-Morse Co.

Mussens, Ltd.

Peacock Bros.

## Engineering Instruments—

C. L. Berger & Sons  
Peacock Bros.

## Engineers and Contractors—

Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Roberts & Schaefer Co.

## Engines—Automatic—

Smart-Turner Machine Co.  
Peacock Bros.

Waterous Engine Works Co.

The John Inglis Co., Ltd.

## Engines—Gas and Gasoline—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.

Alex. Fleck

Sullivan Machinery Co.

Smart-Turner Machine Co.

Peacock Bros.

M. Beatty & Sons

Canadian Westinghouse

John Inglis & Co., Ltd.

Can. Fairbanks-Morse Co.

## Engine—Haulage—

Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.

Canadian Ingersoll-Rand Co., Ltd.

## Engines—Marine—

Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Oil—

Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

## Engines—Steam—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

Smart-Turner Machine Co.

S. Flory Mfg. Co.

Peacock Bros.

M. Beatty & Sons

Laurie & Lamb

Mussens, Ltd.

Can. Fairbanks-Morse Co.

The John Inglis Co., Ltd.

## Fans—Ventilating—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.

Peacock Bros.

Mussens, Ltd.

## Feeders—Ore—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

## Filters—

Krupp, Fried. A. G., Germany

## Friction Hoists—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Forges—

Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.

## Forgings—

M. Beatty & Sons  
Canadian Cleveland Drill Co.

Smart-Turner Machine Co.

Peacock Bros.



# Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.

Main Western Office - VICTORIA, B.C.

SUCCESSORS TO

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Ontario Powder Co.

Acadia Powder Co.

Standard Explosives Ltd.

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## FORCITE

For hard rock mining—wet or dry.

Less fumes than any other explosive.

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Northfield, B.C., Bowen Island, B.C., Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 32.)

**Furnaces—Assay—**

Krupp, Fried. A. G., Germany  
Lymans, Ltd.  
Mussens, Ltd.

**Fuse—**

Peacock Bros.  
Curtis & Harvey, (Canada),  
Limited  
Canadian Westinghouse  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

**Gears—**

Canadian Westinghouse  
Krupp, Fried. A. G., Germany  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

**Generators—**

Canadian Westinghouse  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.

**Hangers—Cable—**

Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.

**Hand Hoists—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Heaters—Feed Water—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Laurie & Lamb  
Canadian Westinghouse  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
G. Taylor Hardware Co., Ltd.

**High Speed Steel Twist Drills—**

Mussens, Ltd.  
Northern Canada Supply Co.

**Hoists—Air Electric and**

**Steam—**

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco  
Waterous Engine Works  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Siemens Co. of Canada, Ltd.

**Hoists, Chain, Electric and**

**Pneumatic—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Hoisting and Conveying Mach-**

**inery—**

Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.

**Hoisting Engines—**

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.  
Sullivan Machinery Co.  
Fraser & Chalmers, Ltd.  
Can. Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Waterous Engine Works.

**Hose—**

H. W. Johns-Manville Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Cleveland Drill Co.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

**Jacks—**

Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

**Jigs—**

Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.

**Lamps—Acetylene—**

Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Northern Canada Supply Co.

**Lamps—Safety—**

Canadian Explosives  
Peacock Bros.  
Ackroyd & Best  
Siemens Co. of Canada, Ltd.

**Link Belt—**

Waterous Engine Works  
Northern Canada Supply Co.  
Jones & Glassco

**Locomotives—Electric—**

Mussens, Ltd.

**Jeffrey Mfg. Co.**

Canadian Westinghouse  
Siemens Co. of Canada, Ltd.

**Locomotives—Steam—**

Mussens, Ltd.  
Canadian Westinghouse

**Metal Merchants—**

Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.

**Monel Metal—**

Orford Copper Co.

**Motors—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
G. Taylor Hardware Co., Ltd.  
Canadian Westinghouse  
Peacock Bros.  
Siemens Co. of Canada, Ltd.

**Ore Sacks—**

Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.

**Ore Testing Works—**

Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell

**Ores and Metals—Buyers and**

**Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Krupp, Fried. A. G., Germany  
Orford Copper Co.  
Canada Metal Co.

**Perforated Metals—**

B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

**Pick Machines—**

Sullivan Machinery Co.

**Picks—Steel—**

Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Thos. & Wm. Smith  
Peacock Bros.

**Pipes—**

Consolidated M. & S. Co.  
Peacock Bros.  
G. Taylor Hardware Co., Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.

**Pipe Fittings—**

Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Canadian Westinghouse  
Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.

**Pneumatic Chain Blocks—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Pneumatic Tools—**

Can. Cleveland Drill Co.  
Can. Ingersoll-Rand Co., Ltd.  
G. Taylor Hardware Co., Ltd.  
Jones & Glassco

**Producer—Gas—**

Krupp, Fried. A. G., Germany  
Mussens, Ltd.

**Prospecting Mills and Machin-**

**ery—**

Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hang-**

**ings—**

G. Taylor Hardware Co., Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

**Pumps—Boiler Feed—**

Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.

Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**

Rock & Power Mach'y, Ltd.  
G. Taylor Hardware Co., Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.

Thos. & Wm. Smith

M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.

Laurie & Lamb

Fraser & Chalmers, Ltd.

The John Inglis Co., Ltd.

**Pumps—Electric—**

Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.  
Siemens Co. of Canada, Ltd.

**Pumps—Pneumatic—**

Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

**Pumps—Steam—**

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
G. Taylor Hardware Co., Ltd.  
The John Inglis Co., Ltd.

**Pumps—Turbine—**

Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.

Can. Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

The John Inglis Co., Ltd.

**Pumps—Vacuum—**

Can. Fairbanks-Morse Co.

Smart-Turner Machine Co.

**Quarrying Machinery—**

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Krupp, Fried. A. G., Germany  
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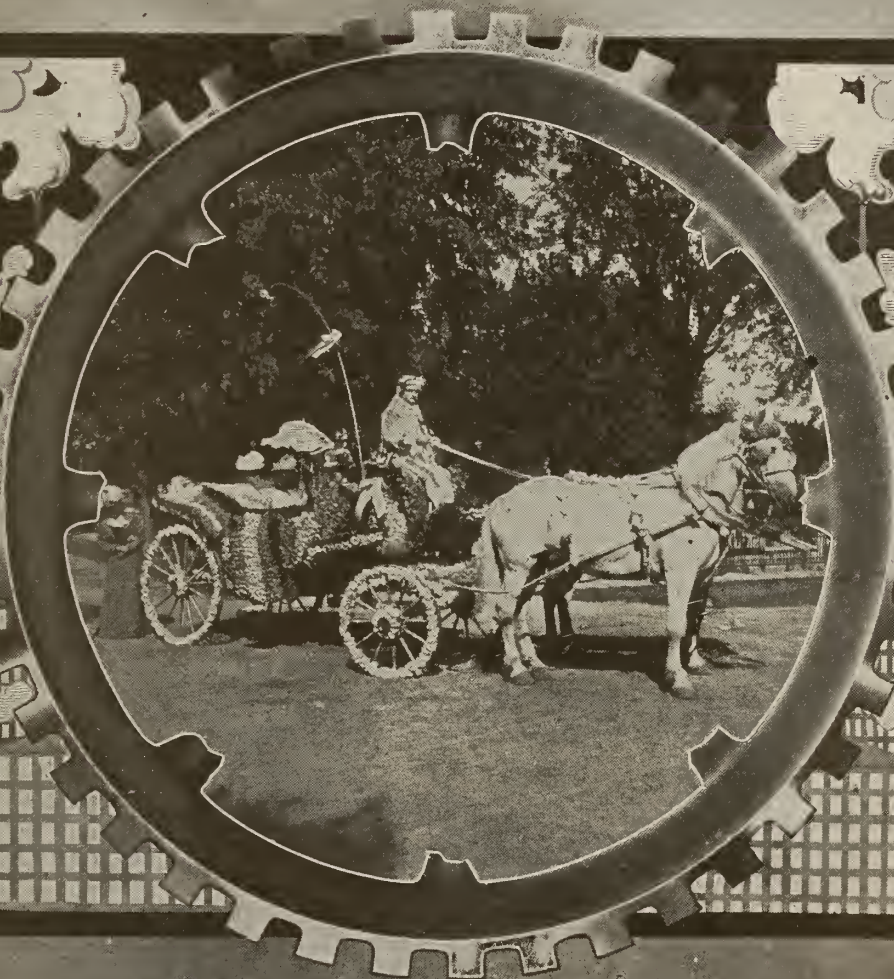
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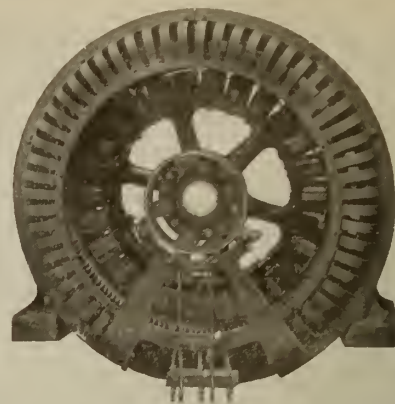


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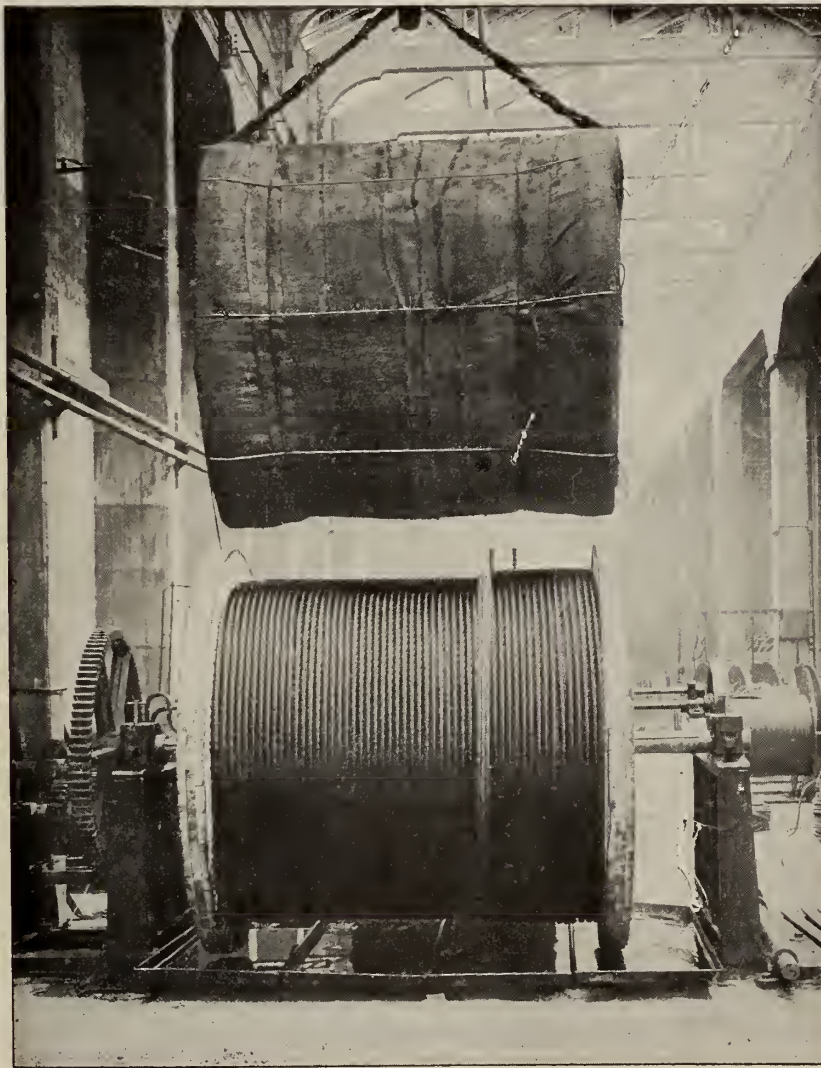
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VOL. XXXV

TORONTO

No. 14

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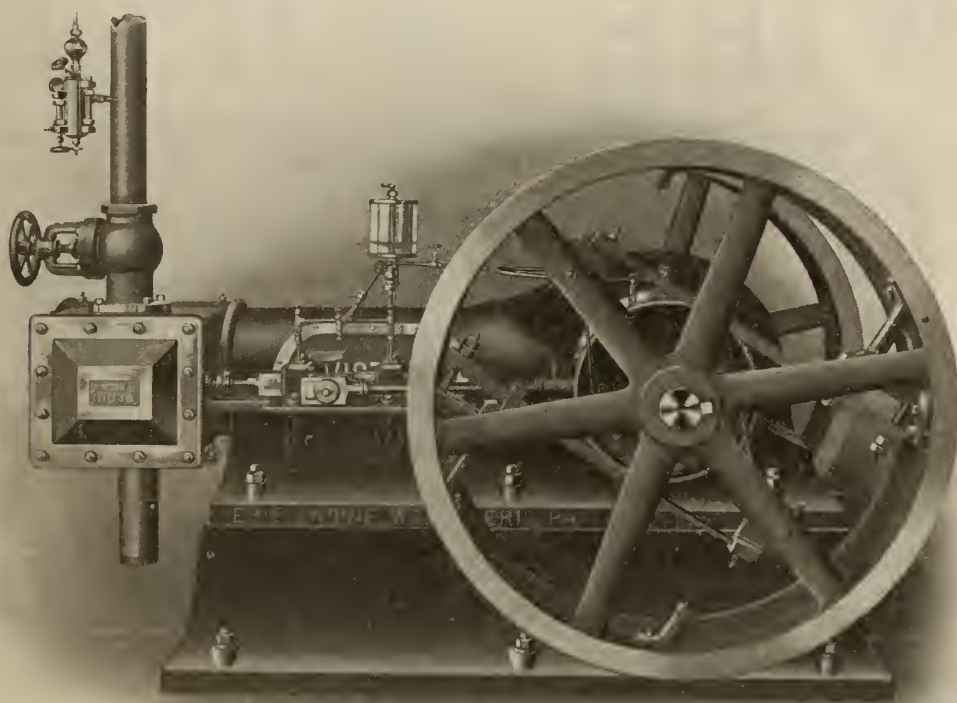
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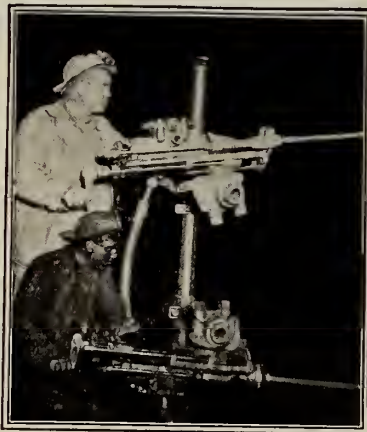
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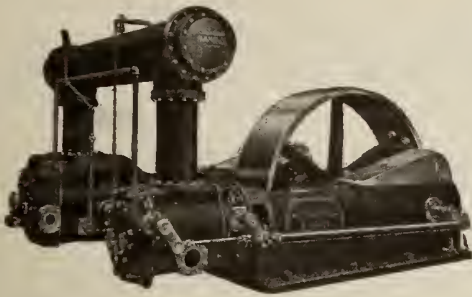
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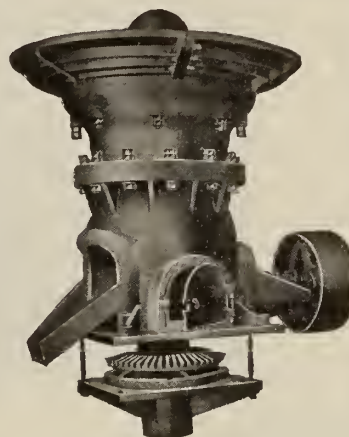
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# Synopsis of Coal Mining Regulations



**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal subdivisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

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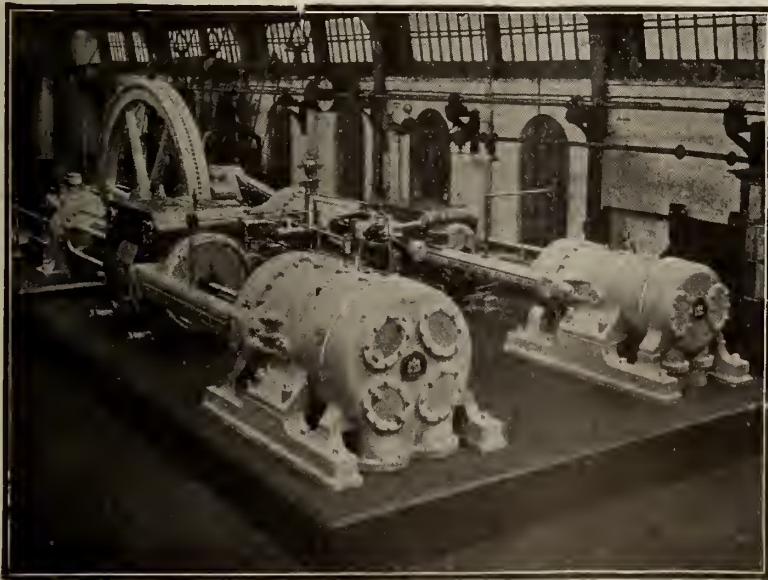
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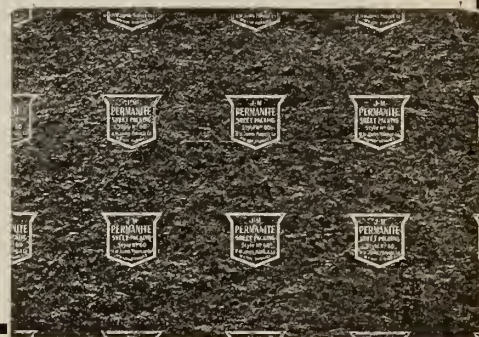
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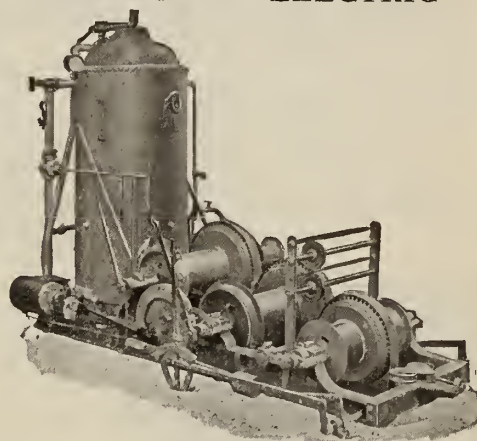
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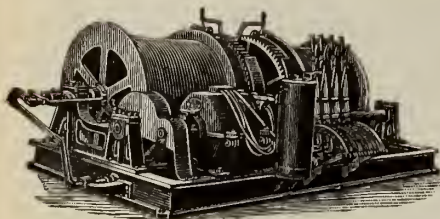
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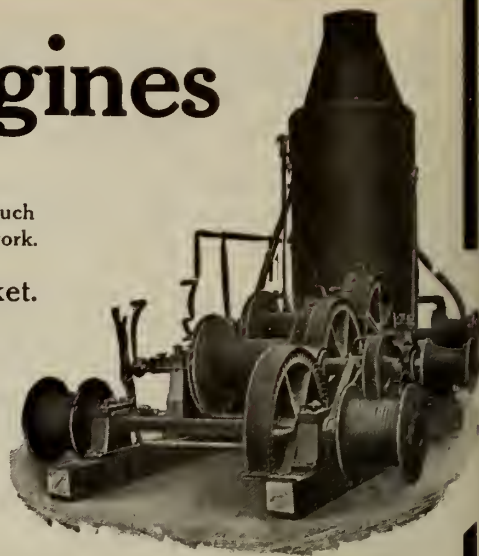
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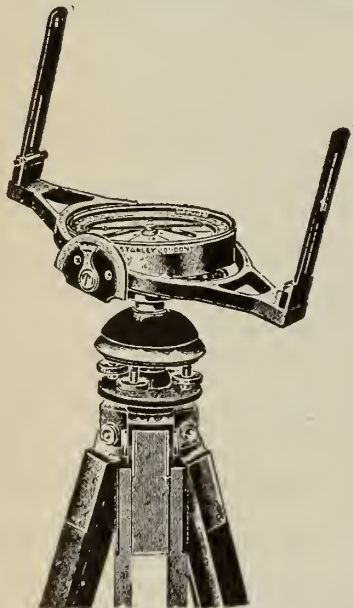
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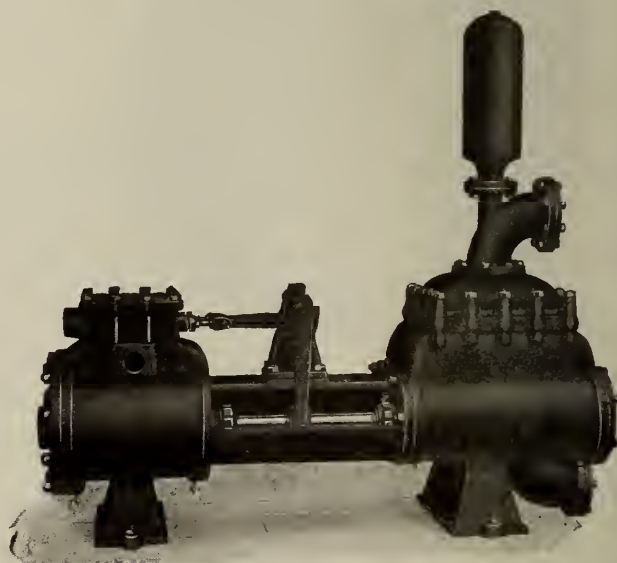
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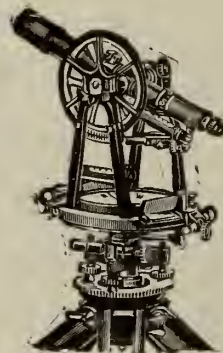
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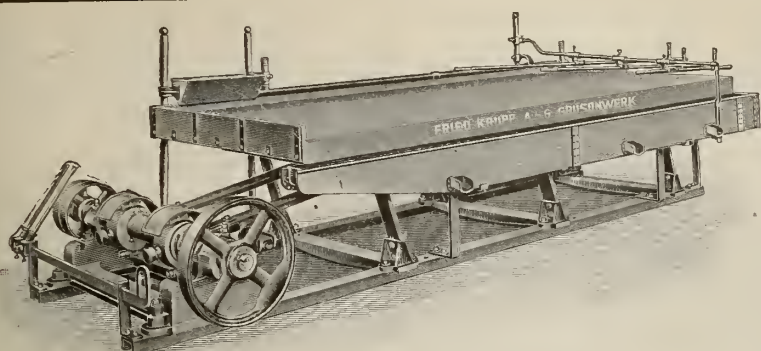
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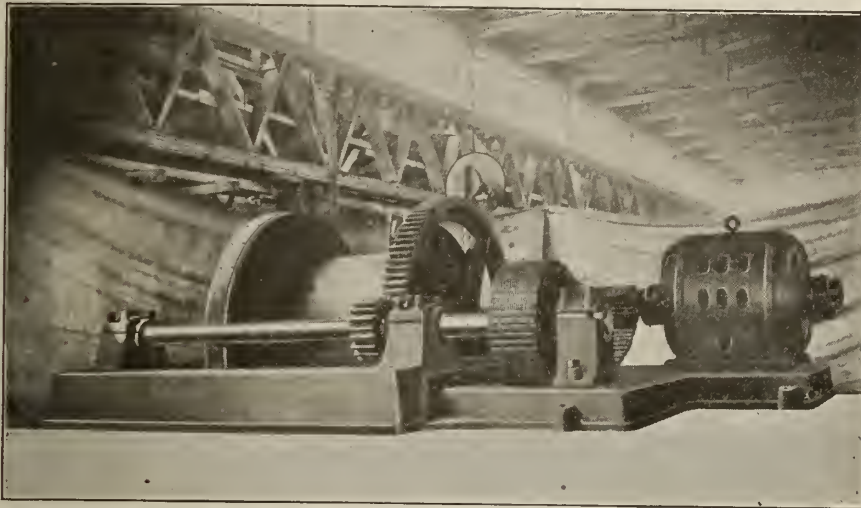
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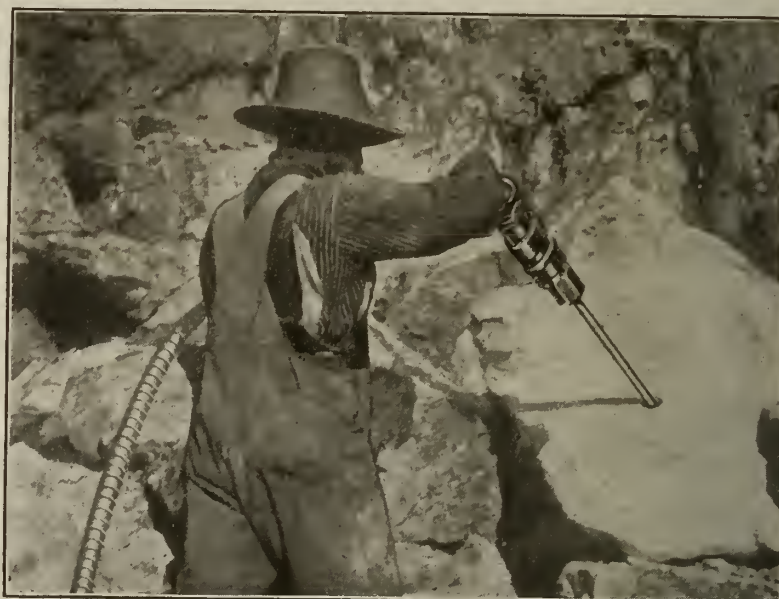
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# THE CANADIAN MINING JOURNAL

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## The Canadian Mining Journal

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Editor

**REGINALD E. HORE**

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## CALGARY OIL FLOTATIONS

It might have been expected that the men who have so successfully advertised many features of Western Canada would be quite capable of bringing to the attention of the public the mineral possibilities of the Calgary district.

For some reason they have not said very much about the coal resources of Alberta. These they are leaving for the attention of careful experienced operators. Coal mining is considered a very prosaic occupation.

But development of oil fields is a very different business. At least it is being conducted very differently. Possibly one of the chief reasons is that there are known to be very large deposits of coal and no one knows whether there are any large deposits of oil or not.

The lack of knowledge concerning the possibilities of the oil field is being capitalized by companies without number. They are ready to offer you for the small sum of fifty cents one share in a company capitalized at \$1,000,000 in 1,000,000 shares of \$1 each. Concerning the amount of oil on the properties the companies know nothing. Neither does the public. That apparently is the reason that the price has been fixed at fifty cents. For that small sum you may have one share in a million in a property of doubtful value.

The price having been fixed and a few acres of land somewhere in the vicinity of another company's property having been purchased or leased, the advertising begins. This is where the Westerner shines. Hasn't he sold real estate to hundreds of people who didn't want it? Why shouldn't he be able to sell shares in a company owning several acres located only a few miles away from an oil well of uncertain value? The very uncertainty is the salesman's most valuable asset. Knowing next to nothing about oil wells or the geology of oil fields the salesman is forced to draw largely on his imagination. And if one feature stands out more vividly than any other it is the Western salesman's imagination concerning future possibilities.

All the methods used in advertising real estate are being used in advertising the so-called oil lands. Many newspapers are used to advantage by the companies. Offices are scattered across the country to rake in the subscriptions. Photographs of derricks, bottles of oil and photographs of the Dingman well are considered the proper fittings for an office window. A few telegrams and newspaper clippings are used to advantage. They may be pasted on the window. The telegrams should tell of supposedly important strikes on neighboring properties. The clippings should be from local newspapers if any can be prevailed on to accept the copy.

That many people will buy stock in Calgary oil companies is a foregone conclusion. The seductive adver-

tisements cannot fail entirely. We would urge on those who buy, however, that they use every possible means of determining where the money goes. A large part of it should be spent in actual exploration. If care is not taken the speculator will not even have the chance he might appear to have.

It is evident that the public is willing to bear a share of the expense of exploring the Calgary field. The money is paid in on the assumption that the companies have been formed to raise funds for exploration. To carry on the work of testing large areas thoroughly, considerable sums must be available. Under the circumstances stock companies are very properly formed. By soliciting funds from a large number of people the owners of lands in the more promising section will be enabled to undertake the costly venture. The buyers of shares assume the risks and should share in the profits if there are any.

Criticism of some of the companies is quite unwarranted for there is evidence that an honest effort is being made to raise money for the exploration of their properties. The risks of the venture being great it is well that the expense should be borne by several rather than by a few. Those who assume the risk should be ready to stand the loss of all the money they invest. There is no certainty of oil being found in paying quantities. There is, however, a chance.

But there is evidence also that many companies have been formed to make profits on the selling of shares rather than to raise money for exploration. These are the companies which the public is warned against. These are the companies which make ridiculous statements as to possibilities and give little or no warning of the risk involved. Some of these companies state that oil exists in paying quantities on their property or adjoining property. In view of the facts, such statements are in practically all cases false and are an indication of the character of the companies. To purchase shares of stock in such concerns is mere folly.

The directors of some of the companies state clearly that they know nothing concerning the occurrence of oil in paying quantity on their property and that they regard it as very problematical. They state that they invite the public to pay part of the cost of exploration in the hope that oil may be found. Such directors are to be congratulated on their frankness.

Some of the properties are located where there seems a fair chance of oil being found. Others are located where the chances are very poor. The intending investor should satisfy himself that the property on which he is invited to spend his money is in a good location and that the directors of the company are making an honest effort to explore the property. Further than that it is quite as necessary that the exploration should be carried on economically, the wells drilled in the most favorable places and by experienced drillers. Otherwise even directors with the best of intentions may waste most of the money raised.

## COBALT SILVER MINES

The closing down of the Hudson Bay mine last week and the announcement of the fact that the La Rose mine is nearly worked out gives force to the prediction that the production of silver this year will be considerably less than in the past few years. Several other Cobalt mines will make serious inroads on their reserves this year.

There need be no fear, however, that Cobalt will cease to produce silver for some years. One company at least has made a large addition to its known reserves this year. Others have much ore in sight and promising ground still to be explored.

There is still to be mined a very considerable amount of high grade ore and an enormous tonnage of milling ore. Further, it is not unlikely that exploration will result in the discovery of new ore bodies on several properties.

## HOLLINGER

The development of the Hollinger mine continues to be very encouraging and gives every day better reason for the statement now being commonly made that Hollinger will be one of the big gold mines of the world.

It is scarcely to be rated as a small mine now, for it is producing ore at the rate of over 500 tons per day and making a profit which allows the company to pay 3 per cent. every four weeks on a capitalization of \$3,000,000 and at the same time make substantial increases in surplus cash.

But this is being done with an equipment that is soon to be greatly improved. An enlargement to the mill is nearly completed and a plant that will house three large new compressors is being erected. Part of the new equipment is for the Acme property; but an increase in production at the Hollinger is being provided for.

By the end of the year the Hollinger and Acme should be fairly started on a long and prosperous career. A career which should do much to show the possibilities of Northern Ontario as a mining district. Cobalt has done much to bring the attention of mining men to Canada. Gold mines like the Hollinger and Acme will serve the same purpose.

## HILLCREST INQUIRY.

Hillcrest, Alta., July 6.—Daniel Briscoe, fire boss in Hillcrest Mine for three years and a half told the official enquiry Saturday morning that he was in the mine up to ten o'clock of the night previous to the explosion. The mine was not working during the time he was in, but he made an examination of the main roads and found gas in No. 3 South Entry.

The barometer, according to his official report, indicated normal. The amount of gas was not by any means unusual, but, as required, he posted a notice outside the mine on the warning board. The quantity of dust was about normal and the heat was nothing unusual. There was plenty of moisture all over the district he covered.—Journal of Commerce.



## THE ROUTES TO MOOSE FACTORY

According to Mr. J. G. McMillan in a bulletin published by the Ontario government railway, power boats cannot be used to advantage on the Mattagami, the Moose or the lower parts of the Abitibi. Transportation must be effected by poling or towing. There are three long stretches of the Upper Abitibi where small motor boats or steamers can be used, when warranted by the amount of traffic. These are from Frederick House River to the carrying place, 13 miles from Island Falls to Lobstick, 28 miles, and from New Post to Otter Falls, 14 miles. For the present the use of canoes only need be considered. These should be of large size and strongly built, to be safe in rough water and to stand considerable hauling over rocks in towing or poling, where there are no portages.

On the Abitibi route, the principal obstacle is the four-mile rapid on the Frederick House. The water in this river is very turbid, rendering it impossible to detect submerged rocks or other obstructions that are even barely covered by water. Great caution must be used to prevent accidents from this cause. Below the long rapids the portages are good and well marked, but the rapids must be carefully approached, especially in high water, as the portages are very close to the head of the falls and the landings are mostly in swift water. Except in very low water, the "Little Lakes Route" should be used in preference to following the river past Lobstick Falls. None of the Indians accustomed to the river use the latter route in high water.

The Driftwood River is easy and safe for canoes to four miles above the crossing. I do not know whether this river can be used up to the T.C.R. If it is navigable, it could be used in preference to the Frederick House. The Mattagami is easily navigated in low water. There are 20 miles of good canoeing on the upper part of the Red Sucker and two miles at its mouth, but the seven miles between these parts are mostly shallow rapids which would be very hard on canoes in low water.

French River can be ascended 80 miles without portaging. Then there are about four miles of rapids and falls. I did not go past these. These falls occur at the junction of the Archean and Palaeozoic rocks, which are here seen in contact. Resting on gneiss or in some cases on diabase, is a layer of sand, or greasy shale, a few inches thick. Then a layer of fragmentary limestone of varying thickness up to five feet, then horizontal layers of limestone that have been subjected to very little disturbance. This limestone strata was not over 50 ft. thick at any point along the river.

The Groundhog or Kapuskasing may be used if desired instead of the upper part of the Mattagami. The Kapuskasing has only two portages and very little rough water.

The Missinabie is probably the safest of all routes to Moose Factory.

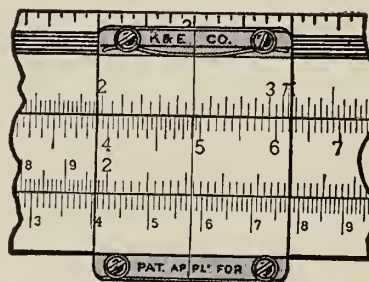
### HOLLINGER.

Foundations for the new plant on the shore of Gillies lake are nearly completed and the erection of the steel structure has been commenced. Three large compressors have been ordered.

The twenty stamp addition to the mill is nearly completed and the new tube mills are being placed in position. When this section is ready increased output will be made. Part of the addition is, however, for the use of the Acme Company.

## SLIDE RULE IMPROVEMENT.

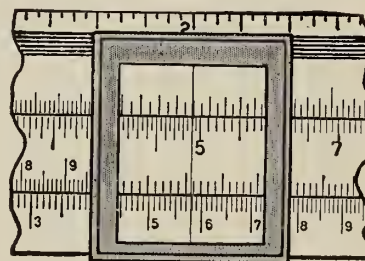
A new patented indicator or runner for slide rules, called the "Frameless" has just been perfected by Keuffel & Esser Co. Every figure on the rule is clearly visible at all times, there being no side pieces to the metal holder of the glass indicator, and, therefore, nothing to hide any of the figures on the rule. This is one of the most important improvements in slide rules—those indispensable instruments for rapid calculations. Often, after setting the old style indicator or runner, the user would find that he could not read



New Style Indicator

the result because important figures were hidden by the frame or holder of the glass. Frequently two, and sometimes four or even six, eight or nine figures would be thus hidden; causing more or less inconvenience and uncertainty in reading the slide rule. The new runner entirely obviates this difficulty.

Thousands of engineers and scientists in every profession and industry, as well as contractors, builders,



Old Style Indicator

architects and merchants have found the slide rule invaluable as a time and brain saver in quickly and accurately making a great variety of calculations. In its various forms, it has been adapted by Keuffel & Esser Co., to the needs of practically every line of work, including all branches of engineering, as well as chemistry.

## A NEW DRAWING PEN.

W. F. Stanley & Co. have placed on the market the new swivel nib drawing pen shown in the accompanying



illustration. This pen is easily and quickly cleaned and can be afterwards set back to make a line of exactly the same width as before.





### THE DRAINING OF KERR LAKE DISCLOSES RICH ORE.

The water has been completely pumped out of Kerr Lake, and the machinery is now being used to remove the mud from the bottom of the Lake. Already the southern slope of the lake basin has been explored by trenches dug through the mud to the rock bottom. The result of this exploration on the property of the Kerr Lake Mining Company has been the exposure of some of the most remarkable veins yet found in the Cobalt district.

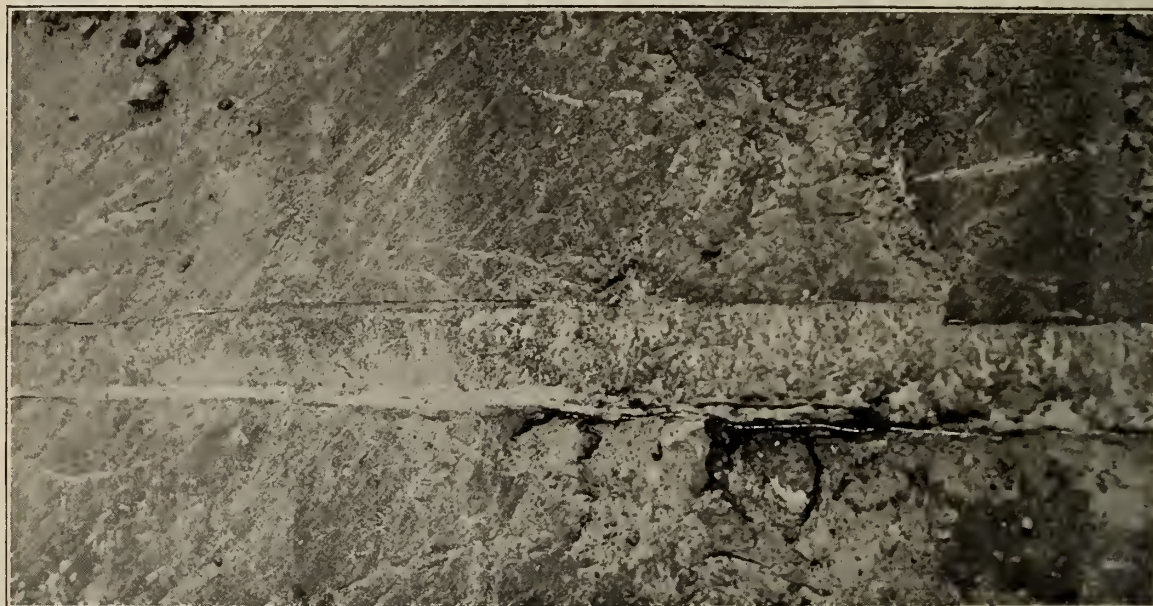
For nearly the whole length of the property there are good showings where the mud has been removed. Of the hundreds of feet of trenching, hardly any has been unsuccessful in uncovering veins. The most important veins run along the slope of the basin, parallel with the shore. Cross trenches were dug at frequent intervals, and it was found that the veins which had been worked underground are much richer at the surface than in the workings.

In addition to the rich ore disclosed in the known veins, some entirely new veins have been discovered. The showings rival anything that has been seen at Cobalt.

the property and both parties laid claim to the receipts during this interval. The buyers also claimed several coal-carrying steamers, which Mr. Dunsmuir alleged were not included in the deal. A question also arose over the current bank account, most of which was exhausted just before the transfer took place by the declaration of a dividend, naturally in favor of the former owner.

### THE HOSMER MINE.

It has been announced that the Canadian Pacific Railway Co., which for a number of years has been developing coal measures at Hosmer, in the Crows Nest Pass district of British Columbia, has definitely decided to abandon its coal mines there. That this decision has been arrived at is evident, for the dismantling of the plant has already been commenced. As there is little, if anything, else to support the business of Hosmer, the result will be the practical wiping out of that small town as well. The broken condition of much of the coal in the several seams opened by the Hosmer Mines, Ltd., under which company name the C.P.R. has been operating here, mining coal and making coke, is the chief reason for the final decision to



A Rich Silver Vein on the Glaciated Rock Bottom of Kerr Lake.

The result of the lowering of the Lake, has been to very materially increase the known reserves of the ore on the Kerr Lake mining property. The adjoining property, that of the Crown Reserve, is still covered by a layer of mud. This mud is being pumped out as quickly as possible by mixing it with water. Up-to-date, however, it has not been possible to prospect the Crown Reserve portion of the lake bed.

### COLLIERIES CASE.

The Privy Council to-day allowed the appeal of the Canadian Collieries (Dunsmuir), Limited, vs. Dunsmuir, and dismissed the cross-appeal. These actions were concerned with the construction of an option to purchase mining property on Vancouver Island.

The case involved more than a million dollars and was quite a celebrated action in the British Columbia courts. Following the sale of the collieries by Mr. Dunsmuir, a natural delay occurred in the delivery of

abandon further attempts to continue work there, notwithstanding that a large sum of money has been expended in developing and equipping the mines and coke-making plant. Hosmer is distant from Fernie (the headquarters in British Columbia of the Crow's Nest Pass Coal Co., which has for 16 years operated the Coal Creek and Michel collieries) in one direction eight miles, and from Michel in the other 14 miles. Some years ago the Crow's Nest Pass Coal Co. abandoned its Carbonado colliery, near Morrissey, ten miles south of Fernie and 18 from Hosmer, so the latter is the second place in the district at which important coal-mining operations have proved unprofitable.

### McINTYRE.

Foundations for an enlargement to the McIntyre mill are now being constructed. An additional tube mill will be placed in the present building and several tanks will be erected in an adjoining building.



# THE VOLCANIC ORIGIN OF PETROLEUM

By Dr. Hans Von Hofer and Eugene Coste

In his paper "The Origin of Petroleum" presented at the New York meeting 1914, of the American Institute of Mining Engineers Dr. Von Hofer discussed at some length the hypothesis of volcanic origin advanced by Mr. Coste. Mr. Coste's reply has been recently published and we reprint here from the bulletins of the Institute, the arguments.

## Dr. Von Hofer:

Eugene Coste, of Calgary, seems to be the most zealous American defender of the inorganic origin of petroleum. Three of his papers on the subject lie before me: (1) *The Volcanic Origin of Oil* (Trans., A.I. M.E., 1904, p. 288); (2) *The Volcanic Origin of Natural Gas and Petroleum* (Journal of the Canadian Mining Institute, vol. vi, 1903, p. 73), and (3) *Petroleum and Coals Compared in Their Nature, Mode of Occurrence and Origin* (idem, vol. xii, 1909, p. 273). He sees in petroleum "the product of volcanic solfataric emanation." In the following critical examination of his proofs, I refer chiefly to the interesting paper last named, which is the most recent, and, moreover, takes account of the arguments previously stated in the two others.

I must express in advance my surprise at his statement (p. 275): "The petroleum series includes all the natural hydrocarbons with the exception of the marsh gas." This hydrocarbon is found in every petroleum, though it escapes as a gas very rapidly, as soon as the oil is exposed. Of natural gas, it is generally the essential constituent.

## The Proofs Advanced by Coste.

Mr. Coste says in one of his papers: "The vital point is to actually show the carbon and hydro carbon in the igneous rocks, lavas and emanations proceeding from these internal fluid magmas."

As illustrative instances, he cites (on p. 278 and following pages of his latest paper) the following:

1. "Oil in crystalline gneiss: In Placerita Canyon, five miles east of Newhall, Los Angeles county, California, a very light oil, almost naphtha, of a gravity between 50° and 60° B., is produced from crystalline gneisses which overlay the San Gabriel granite."

According to the investigations of G. H. Eldridge and Ralph Arnold, this so-called crystalline gneiss is not gneiss at all, but a metamorphic crystalline schist, perhaps Jurassic, and hence by no means an Archaean rock which could possibly be regarded as eruptive. It is a metamorphosed sedimentary, and can give Mr. Coste no help—rather the contrary. The oil of this locality may be in its primary deposit, or, more probably, it may have found its way thither from the neighboring Tertiary oil-field.

2. "Oil and bitumen in the quicksilver deposits of California."

Being unacquainted with the geological relations of that district, I can offer no suitable explanation of this occurrence, and will only remark that these bitumens may have been extracted and transported from deeper bituminous rocks by the ascending ore-bearing solutions. Spirek ascribes to bituminous rocks the occurrence of bitumen in the Tuscan quicksilver-mines. Since the bitumens occur very seldom in ore-deposits—particularly in deep-seated veins,—they cannot be regarded as a general product of deep volcanic zones.

They must have a purely local cause. At all events, such scanty occurrences of bitumen of all sorts prove nothing as to the formation of rich petroleum-deposits. This has been emphasized by Prof. Dr. L. Mrasec, of Bukarest, who is inclined, moreover, not to admit a deep source for the rare occurrences of bitumen in ore-deposits.

3. "Graphite and natural gas in the metalliferous vein of Silver Islet, and graphite in the veins at Cobalt and Ducktown, Tenn."

To these instances also, what I have already said is applicable. No one would dare to infer from the sporadic occurrence of graphite in mineral veins that deposits of graphite are of volcanic origin—still less when (as in the Kaisersberg, Styria) the graphite is accompanied by plant-fossils. It seems to me equally audacious to argue the origin of the great deposits of petroleum found in sedimentary rocks, from the isolated and quite insignificant occurrences of bitumen in veins.

4. "Solid petroleum in pegmatite dykes, and other veins, associated with uranium, radium and vanadium."

We are here concerned, not with "solid petroleum" (a contradiction in terms, since petroleum is a liquid), but with a bituminous mineral, the combustion of which left an ash which, in one locality not named, contained uranium, and in another place, in Peru, contained vanadium. The remarks already made under (2) and (3) are applicable here; and I will only add that petroleum is almost entirely free from ash.

5. "Graphite, diamond and hydrocarbons in meteorites."

This phenomenon bears no relation to the origin of petroleum, nor is it at all surprising, since in the original cosmic material carbon must have been present (probably as carbonic acid), and must have been segregated in the meteoric masses, as in that of the earth.

6. "Oil and natural gas in volcanic rocks in Europe, Africa and Mexico."

These occurrences, few in number and always very small in extent, may be due to coal-beds or bituminous rocks which the volcanic eruptive broke through, distilling out and absorbing into its own mass some oil and natural gas. This distillation of bituminous material has long been practised in the Scotch shale-oil industry.

7. "Natural gas in serpentine, Asiatic Turkey" (Chimaera).

Alexander von Humboldt suggested long ago that this emission of gas might be connected with petroleum. E. Tietze, who studied the phenomenon on the spot, adopts this view, and calls attention to the neighborhood of the so-called "Flysch" formation, which so frequently carries petroleum.

8. "The occurrence of oil around volcanic necks, Mexico."

This proves nothing, since the mineral oil of Mexico, and especially of the State of Tamaulipas, named by Mr. Coste, is widely distributed, and occurs both near volcanic necks and far from them. Villarello, Division-chief of the Mexican Geological Institute, and one of those best acquainted with the oil-occurrences of Mexico, concludes: (a) that the oil comes from a marine



fauna; and (b) that, in the districts explored hitherto, it is found only in secondary deposits, situated in highly disturbed terrain, connected frequently with basaltic eruptions. Since the volcanic tuffs are highly porous, it is not surprising that the oil, in its migration, should accumulate there in special abundance.

Of all the foregoing proofs of the volcanic origin of petroleum, only two, No. 1 and No. 8, are really pertinent to the question of the genesis of valuable deposits of oil. The rest are so insignificant that they prove nothing as to the production of oil in large quantities, and have for us only a purely scientific interest. And the two exceptions, adducing the occurrence of petroleum in alleged gneiss, and in connection with volcanic necks, have been shown, I think, to be entirely inadequate as proofs.

As a logical consequence of Mr. Coste's view, deposits of petroleum should always be found in the vicinity of volcanic eruptions. But this is not the fact. In the Carpathians, the "outer bend," through Galicia, the Bukowina, and Roumania, is free from eruptives and rich in oil, while the "inner bend" is rich in eruptives and poor in oil. At Baku, in Alsace, and in North Germany, as in Canada, New York, Pennsylvania, Ohio, West Virginia, Louisiana, Texas, etc., there are no eruptives near the rich oil-deposits. In Java, Sumatra, Borneo, and Burmah, the oil fields are far from the regions of eruptive activity.

These weighty facts, completely contradicting the volcanic hypothesis, Mr. Coste seeks to deprive of force by the assumption that oil and gases have ascended from greater depth through fissures, and thus were deposited far from eruptive masses. But it is remarkable that the Hungarian Carpathians are much more disturbed than those of Galicia and Roumania, and are, nevertheless, poorer in oil—indeed, for the most part, contain no oil at all. The most important and profound disturbance of the Galician Carpathians—the so-called Klippenzone—is barren of oil, like its neighbor, the Weichselbruch. The Alps are traversed by deep faults and dislocations, many of which still make themselves disagreeably felt as seismic surfaces; yet no noteworthy oil-deposits have been found among them. At the foot of the Alps on the north, the gas-springs of Wels, in Upper Austria, are found in quietly deposited and undisturbed Miocene strata. In the rich oil-bearing flat anticlinals of Pennsylvania, I sought in vain for any dislocations worthy of mention; and not one of the intelligent "oil-men" whom I met could point me to any such thing. East of that oil-region, we find in the Appalachians mighty disturbances of all kinds—deep fissures, sharply arched anticlinals,—but no oil. At Pechelbronn, in Alsace, the slightly inclined oil-bearing sandstones were formerly mined and thus thoroughly explored, without the discovery of a single dislocation, showing that the oil was occupying its primary place of deposit. K. Kalickij proved the same proposition for the oil-occurrences on the island of Tschelaken. Even the photographs accompanying his paper are conclusive.

#### The Objections Advanced by Coste.

In order to weaken objections to his own theory, Mr. Coste urges the following objections to the theory of organic origin:

1. "It cannot possibly explain the large petroleum fields below the Carboniferous."

Can the solfataric hypothesis do that? No: Mr. Coste's proofs—except No. 1 and No. 8—rest wholly upon isolated and minute occurrences of bitumen. No one has ever observed at a solfataria any accumulation

of petroleum worthy to be mentioned. On the other hand, F. Quenstedt has shown that 1 square mile of the bituminous Posidonia slates of Suabia, rich in animal fossils, contains 200 million hundredweight of oil. In other words, the animal remains of a single sedimentary bed can furnish enormous amounts of oil. What was possible after the Carboniferous era may have been possible before it also. Biological activity on the earth has been immense, continuous, and widespread; whereas volcanic activity has been local, and often but temporary, discharging here and there comparatively insignificant quantities of hydrocarbon gases.

2. "Neither can it explain the petroleum in the volcanic emanations of to-day."

No considerable quantity of hydrocarbon has ever been found in a solfataria. And where only one or a few per cent. have been found, they can be referred to bituminous strata which have been intersected. Moreover, positive reports of hydrocarbons (usually given as methane,  $\text{CH}_4$ ) are to be received with caution. The gases of the Hawaiian volcano Kilauea are often cited as an example. But when collected directly by L. Day and E. S. Shephard they were found to contain no hydrocarbons at all. So this proof also fails. The small quantities of marsh-gas, produced by Brun at Geneva through the heating of certain lavas, may have formed themselves during the process through the decomposition of other gases, for instance, according to the equation



3. Nor can the organic theory explain the petroleum "in the volcanic or igneous rocks in all parts of the world."

4. "Nor in crystalline rocks; in California and New Brunswick, for instance."

5. "Nor in meteorites."

6. "Nor in metalliferous veins."

These four points have been already discussed, and shown to be invalid.

7. "It is also at a loss to explain why the petroleum fields in every district are found grouped along certain lines and why the petroleum is found there in many horizons, while outside of the lines in just the same strata and over much larger areas all the horizons are barren."

This raises the comprehensive question of the structure of the petroleum-deposits, which cannot be treated within the limits of this paper. I will only say briefly that the oil is found along certain lines, because it occurs (1) in fissures, (2) in folds, and (3) in long-drawn channels of sand. The fissures are directly connected with the primary deposits. In folds, anticlines, monoclines, etc., the position of the oil is determined by the accompanying natural gas and water. The three substances arrange themselves according to their specific gravity, along the lines and surfaces presented by the shape of the fold. If the oil-bearing sands occur in long, slender bodies, as in Alsace, the grouping of the oil "along certain lines" is not surprising. Since the oil-deposits are coastal formations originating under special conditions, it is comprehensible that they cannot follow throughout the same geological horizon.

8. "It cannot explain how the petroleum can possibly travel out of their supposed organic-remain source in some impervious clay or shale to accumulate in a few porous receptacles far distant laterally and sometimes hundreds and thousands of feet above, or even below as some assert, and this all through most impervious rocks and without any impelling force be-



hind, or any cracks, joints or fissures to follow since the decomposed products of the organisms must naturally be supposed to come from the whole mass of the strata through which the organisms were and there could not be fissures, cracks and joints to all parts of the strata."

If I understand Mr. Coste correctly, this passage is directed, not so much against the theory of organic origin as against the hypothesis, so popular in America, of the regional migration of petroleum. In this respect, I heartily agree with him. I too maintain that the migration of oil can take place only in cracks, joints, and fissures, the source of motive energy being (as has been often demonstrated) the accumulation, in the primary deposit, of natural gas under high pressure.

9. "It cannot possibly explain why the petroleum, although found to-day in their reservoir-rocks under strong pressures, cannot by means of that pressure, return and disperse back to their original sources; they should be able to return the way they came, nothing is to prevent them and there is plenty of pressure for the return voyage if one admits the first voyage from the organic source."

This question might be applied to Coste's hypothesis also. As already remarked, petroleum is driven by gas-pressure to a considerable altitude in fissures; and its removal leaves in the original deposit a space in which the gases collect and keep the oil above them, as, for instance, in the so-called inverted siphon, when partly emptied, the entrance of carbonic acid gas continues to maintain the height of the water in the discharge-pipe.

10. This objection, based on alleged features of the occurrence of petroleum in California, I must leave to my esteemed colleagues, Ralph Arnold, B. Anderson, G. H. Eldridge, and other distinguished investigators of the oil-geology of that State. It will possess for them no difficulty.

11. "It cannot possibly explain again, if the petroleum can travel so freely through the strata as to be able to accumulate under an anticline from organic remains deposited far and wide laterally (at least a mile or two or much more in order to allow for the quantities obtained in many fields), why they did not escape out into the free air only a few hundred or a few thousand feet away at most; the shales above the sands are not any more impervious than the shales below the sands, which on that theory are supposed to be the source of the petroleum, and if they can travel freely through the shales which are the most impervious rocks of the sedimentary series, I repeat, what is to prevent them from getting out into the atmosphere?"

This question properly concerns, not the organic origin of petroleum, but a hypothesis of its migration, advanced to explain the formation of productive deposits—a hypothesis which I reject, holding that petroleum originated in the sands in which it is found, unless it has passed through fissures to other sand-strata.

12. "It cannot account for the continual absence of petroleum in the hard parts of organisms preserved in the sedimentary strata."

Oil can be found from the soft parts of animals under certain conditions only, among which is the exclusion of air. We find on the seashore many hard parts, such as shells and skeletons, of marine animals, from which their organic contents have totally disappeared, having been destroyed by the oxygen of the air. Since this generally finds access to dead animal matter, we

find the hard parts without oil very frequently, and oil itself infrequently in comparison, because only under special favoring conditions.

13. "It cannot explain the evident non-connection of petroleum deposits with coal-beds."

Since the latter are land-formations from plants containing cellulose, while the former are marine estuary-formations from animal remains, there can be no connection between the two organic processes or their products.

14. "It cannot account for the continual association of petroleum with strong salt and sulphur waters."

Since the original materials of petroleum accumulated in marine bays, having but limited relations with the ocean, the presence of strong salt water is not surprising, but constitutes, on the contrary, a proof of our theory. Sea-water is known to contain sulphates also, which, in the process of oil-formation, can be reduced to sulphides, or even to sulphur. As a marine formation, petroleum may be accompanied by salt, gypsum, calcite, and dolomite; and this explanation of their presence seems to be more natural than that of a volcanic source.

### Further Consideration.

I have thus answered in detail both Mr. Coste's objections to the organic, and his arguments for the inorganic, origin of petroleum. The latter, however, constitute, strictly speaking, an incomplete statement; for he contends only that petroleum was brought by solfataras into the cooler parts of the earth's crust. Concerning the questions, out of what and how it was formed, he is entirely silent. His explanation, even if we were able to accept it as correct, goes only half way. Like those of his predecessors, Lenz (1831), Rozet (1835), S. W. Pratt (1846), Choucourtois (1863), Thore (1872), Fuchs and Sarasin. It is at best a plant without a root.

Even if we had proved, or should hereafter prove (as has never yet been done), the presence in solfataras of large quantities of marsh-gas,  $\text{CH}_4$ , such gas would stream into the air, without forming petroleum. Besides, we know of no process by which  $\text{CH}_4$  can be converted into the higher members of the paraffine series, or any member of the naphtha series. This circumstance likewise deprives the very rare occurrence of  $\text{CH}_4$  in ore-deposits or volcanic rocks, of all significance as to the origin of petroleum.

As a sincere friend of the petroleum industry, I am heartily sorry that I must reject Mr. Coste's emanation-theory; for, if it were true, we might expect our petroleum-supply to prove inexhaustible, new quantities being continually furnished by solfataric activity. Unfortunately, that is not the case.

Mr. Coste mentions an occurrence of hot water with petroleum in Texas. This is a purely accidental phenomenon; since neither in the great Yellowstone region of thermal springs nor in any of the European hot springs has petroleum, or even marsh-gas, been observed.

Why are oil deposits lacking in the highly fissured true Archæan rocks of Scandinavia, Bohemia, the central Alps, the Appalachians, etc.; and why do they appear first in the sedimentaries deposited at a time when the earth had become populated with organisms? This can be construed only as a proof of the organic origin of petroleum.

If this oil had ascended from great depths, it would have impregnated all porous strata. But, on the contrary, we find repeatedly, between two oil-bearing



horizons, porous rocks containing no oil, like, for example, the Jamna sandstone in the Galician Carpathians. Underlying the oil-sands themselves, there are porous, yet barren, rocks.

If petroleum were the product of distillation at high temperature it could not maintain any primary paraffine, and it would be richer in olefins. Neither of these conclusions is confirmed by the facts.

The occurrence of free nitrogen (not in the form of air) in many petroleum and (often in considerable amount) in natural gas, cannot be explained by any volcanic hypothesis, but furnishes another strong proof of organic origin. The same may be said of the optical properties of petroleum, and of the presence of cholesterolin, which seems to be a condition of the polarization, and is a special indication of animal origin. Moreover, the high-molecular pyridin bases, observed in many oil-regions (Galicia, Alsace, Baku, Fergana, Roumania, Sumatra, California, Egypt, Algiers) speak conclusively against a volcanic, and in favor of an organic—particularly an animal—origin. The general chemical character of petroleum as an unstable mixture of hydrocarbons bears similar testimony against any supposed pyrogenic process at high temperature.

All geological and chemical facts concerning the occurrence of petroleum bear unanimous witness in favor of its organic origin, and hence conclusively against its production from inorganic substances, and the collateral hypothesis of emanation. The doctrine of the volcanic origin of petroleum deposits must therefore be pronounced to lack scientific foundation.

To demonstrate this fact in a review of the publications of Mr. Coste, one of the most meritorious and zealous representatives of that hypothesis, has been the purpose of the foregoing remarks. Hence I have adduced proofs of organic origin only so far as they contradicted the opposite view. For a detailed exposition and defense of the former theory, I refer to my two books: *Das Erdöl und seine Verwandten* (3d ed., published by Vieweg at Braunschweig in 1912), and *Die Geologie, Gewinnung und der Transport des Erdöls* (published by Hirzel of Leipzig in 1909), the latter of which constitutes vol. ii. of the comprehensive monograph issued by Engler and myself under the title, *Das Erdöl*.

**Mr. Eugene Coste.**—Before answering Dr. v. Hofer's points against the solfataric volcanic origin, I may be permitted to resume what I understand from his paper to be his own views, and what he frankly states as his position on the question. He narrows the origin of petroleum to the direct transformation of animals or fatty plants (such as diatoms) without cellulose; and he considers that the organic matter was originally in the "sands" in which the petroleum are now found, unless in the cases where petroleum have passed afterward through fissures to other sand strata. Dr. v. Hofer also considers these sands to be coastal marine formations, deposited in shallow bays of the sea, where under special favoring conditions, the oxygen of the air did not destroy as usual the animal or fatty plant matter, which was therefore entombed, and afterward through the agency of long time was gradually distilled at low temperature and under high pressure, and became petroleum.

The clear statement of these views forcibly suggests at once the following objections to them:

1. Why is not this process in active operation in the world to-day? Why can we not abundantly verify it, and witness it in numerous cases in some of the millions of shallow bays of the sea teeming with life, where

sands are being deposited to-day, and have been deposited in recent ages under similar conditions? It is not enough to cite in support of this hypothesis a very few cases, in which empty shells, or organic matter partly decomposed, were evidently impregnated with petroleum by seepage through fissures or seams from underlying reservoirs.

2. It is also erroneous to say that this hypothesis was accepted by eminent authorities, "mostly in view of the circumstances that the bituminous rocks carry the fossil remains of animals." As a matter of fact, the fossil remains of animals or plants are found mostly in shales which are, as a general rule, absolutely barren of petroleum. It is only very occasionally, surely not in 1 per cent. of the cubic contents of the strata, that bituminous rocks, or rocks (either shales, sands or limestone) containing petroleum, are found; and, as a rule, these spots are comparatively small and are very poor in fossils. The other 99 or more per cent. of the strata really contains the fossil beds; and these fossil beds, as is well known, are barren of petroleum. Although some of these shales may be carbonaceous, they are not bituminous or petroliferous.

3. This brings one to the third serious objection to the view of Dr. v. Hofer, namely, that the "petroliferous sands" are so poor in fossils, and the petroliferous sand-reservoirs are so limited in extent and thickness, with impervious rocks all around them (since we find heavy gas pressures in these reservoirs), that the enormous quantities of petroleum they have produced cannot possibly be accounted for in that way. I will cite only one instance: viz., the example of the small dome of Spindletop at Beaumont, Texas, where from a little over 200 acres, some 50 000,000 barrels of oil have been produced up to date. The oil "sands" under that dome are secondary crystalline limestone or dolomite masses, found only under the dome area of a little over 200 acres, the surrounding strata being impervious clays and sands and "gumbo" beds, with fossils but without oil. The secondary crystalline limestones or dolomites under the dome, containing these enormous quantities of oil, are not fossiliferous; but even if they were, the oil in them could not be indigenous in such quantities, and undoubtedly came up the chimney under the dome from below, since it cannot have come from the impervious sides.

This reasoning from indisputable facts, patent in many fields, long ago forced the American geologists to the conclusion that the petroleum cannot have been produced in the sands they now occupy. On the other hand, most of the American geologists, and many others, conceive a regional migration of oil out of the impervious surrounding sediments into the sands—which, of course, is also impossible. Dr. v. Hofer agrees with me that there is no possible regional migration of oil through the pores of such impervious clays and shales as surround the "sands," and "that the migration of oil can take place only in cracks, joints, and fissures;" but his primary deposits, "the porous sands," are evidently altogether too small in cubic capacity, and too poor in organic contents, to furnish the enormous quantities of petroleum which have actually been produced from them.

Moreover, in the different fields of the world we can trace these primary sand deposits of Dr. v. Hofer lower and lower down in the geological scale, until we find them not only in the Devonian and Silurian but also in the Cambrian (Potsdam sandstone in N. Y. state) and in the crystalline rocks (Newhall, Cal.). This forces us to admit a still lower source, namely, the



volcanic magma; and when these volcanics everywhere give so much evidence of containing large quantities of hydrocarbons either in their associated solfataric gases or in the lavas themselves, why should we reject that source to which we are forcibly led by the full consideration of the geological evidence mentioned above?

4. If the petroleum deposits were coastal marine formations, deposited in shallow bays of the sea, they would be found under geographical alignments entirely different from the straight oil belts in which they are actually being found. The oil belts are evidently connected with the tectonic and orogenic disturbances of each region, and not with the ancient shore lines of the different formations. Moreover, along the same belt we find the petroleum impregnating sands of many different ages. In California, for instance, from and including the crystalline rocks to the Quaternary, there is a thickness of some 30,000 ft. in which productive sands are found. Yet, outside of the productive narrow belts along the Coast Range these 30,000 ft. of strata are barren of petroleum. Surely it cannot be imagined that marine bays of the ancient seas could align themselves in that way along fault lines or straight disturbed zones, and juxtapose themselves, one on top of the other, in formations of so many different ages, according to just the same tectonic zones of disturbance.

5. In shallow bays of the sea, in which sands are deposited, the organic matter is generally observed to have totally disappeared, having been destroyed by the oxygen of the air. Dr. v. Hofer admits this; but he speaks of vague special favoring conditions which occasionally permitted the preservation and entombment of the organic matter. Would such special favoring conditions explain the enormous quantities of petroleum in the world? And why should these special favoring conditions occur at repeated periods during long ages in the same district along fault lines or disturbed zones; and what are these special conditions, anyhow? If petroleum were deposited in shallow bays, what about the deep vertical chimneys of Texas and Louisiana with several thousand feet of thickness of salt impregnated with petroleum?

6. Admitting, for the sake of argument, that the soft organic tissues of animals, or the fatty tissues of plants, were occasionally entombed, how did the transformation of these into petroleum take place? Dr. v. Hofer says it was by the action of long time, which permitted a slow distillation at low temperature; and, strange to say, as a synthetic proof of that proposition he gives the experiments of Engler, in which oils similar to petroleum were produced from organic fats by heating in a retort at temperatures from 300° to 400° C.—experiments made under conditions of temperatures entirely different from those which obtain in nature, and therefore not in the least to the point. If long time distilled some of the organic matter of the sediments into petroleum, how is it that it did not produce any other effect on these sediments, and on the “coals” contained in them, which are unaltered and undistilled? And if long time could replace temperature in bringing about distillation, should not everything on this earth be in a gaseous state, as there has been all the time imaginable in the eternity behind us to bring about the same effect as the highest imaginable temperature? Phenomena of physical or chemical changes of state in elements require certain temperature points and will not take place at a lower temperature, no matter the length of time. One might as well say that

by leaving a turkey long enough in cold storage it would cook itself!

I will now take up in their order Dr. v. Hofer's criticisms of my proofs as contained in his paper.

1. I, of course, never intended to state anywhere in my papers that there was no methane in petroleum; what I did say was, that the marsh gas formed from the decomposition of plants is quite apart and different genetically from the methane of petroleum.

2. Whether the crystalline schists or gneiss, from which a very light gravity oil is produced near Newhall, Los Angeles county, Cal., is a metamorphosed sedimentary or not, and is of Jurassic age or of Archean age, makes absolutely no difference in the point which I raised about this occurrence of petroleum, namely, that the petroleum is found in crystalline rocks and therefore cannot possibly be indigenous, and must come from the San Gabriel granite or the magma below. If these crystallines are ancient sediments, they must certainly have lost all their organic matter during the metamorphosis, and especially such light gravity oil as is found there must have an extraneous origin. To attribute that origin to the neighboring Tertiary oil field is altogether impossible; since light oils of that nature, full of gas, never go down in the strata but always ascend.

3. To suppose that the oil and bitumen in the quicksilver deposits of California and elsewhere may have been extracted and transported from deeper bituminous rocks by the ascending ore-bearing solutions, is to reverse the problem without the shadow of a proof. One might as well suppose that the quicksilver itself in these veins had its origin in the wall rocks, instead of the ascending ore bearing solutions. It is well known to mining geologists that ore-bearing solutions, circulating in veins and fissures, sometimes impregnate the wall rocks and become diffuse in them; but they cannot do the reverse, and receive their contents from these wall rocks.

4. I must differ entirely with Dr. v. Hofer when he says that the occurrences of bitumen, petroleum, or graphite in metalliferous veins, pegmatite dikes or volcanic rocks, are scanty or sporadic occurrences. I maintain, on the contrary, that they are frequent all over the world and constitute positive and overwhelming proofs that these products, in all such cases, have an inorganic origin. To suppose that volcanic or eruptive rocks can distill and absorb into their own mass petroleum or natural gas from bituminous materials in the wall rocks, is again to reverse the question without the semblance of a proof, and moreover, involves an impossibility. One cannot look for distillates inside of the hot mass which produces the distillation. The very word “distill” means “driving away.”

5. The occurrence of oil around volcanic necks in Mexico is questioned by Dr. v. Hofer, who says that it is widely distributed. From all the records of reputable geologists who have examined the occurrences of oil in that country, and even from the records of Mr. Villarejo, quoted by Dr. Hofer, it is quite clear that the petroleum deposits are always intimately connected with the volcanic necks. In fact, this is one of the clearest evidences in the world of the solfataric volcanic origin of oil in enormous quantities.

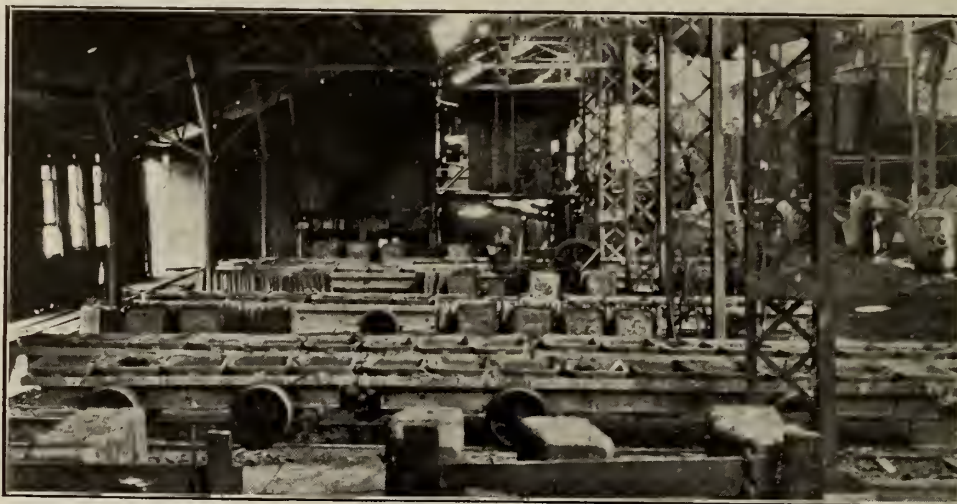
6. Dr. v. Hofer says that, as a logical consequence of my views, deposits of petroleum should always be found in the vicinity of volcanic eruptions. As we have just seen, when it is found in such vicinity in enormous quantities, as in Mexico, the proximity and connection of the volcanics and the petroleum are



denied. But when the volcanics are not plainly to be seen, then their occurrence in the petroleum fields is demanded. Faulting and fissuring connected with volcanic manifestations take place all over the world, not only in mountainous regions but also in regions of plains, and may be, and are, often accompanied with solfataric emanations, though the lava or volcanic rocks themselves do not appear at the surface. It is clear upon careful consideration of these phenomena that any belt of country very rich in eruptives, such as the "inner bend" of the Carpathians cited by Dr. v. Hofer, might be too much faulted and fissured to permit the storage of the gaseous emanations in the greatly disturbed and broken surrounding sediments, while another belt of the same country such as the "outer bend," which is sufficiently fissured to permit pent-up vapors and gases to force their way through to the porous portions of the sediments, and yet not so much as to permit their complete escape to the surface, would naturally furnish the best and richest petroleum fields. Even in such oil fields as those of Pennsylvania and northwestern Ohio, where the strata are apparently undisturbed, we find such well-marked breaks as the Eureka-Volcano break and the grahamite vein of solid petroleum near Cairo, in West Virginia, and the famous Findlay break in northwestern Ohio, so well described in several of Orton's reports as the most pronounced

Boundary districts of that Province, visiting mines and reduction works and meeting mining men.

To the representative of a provincial newspaper, Mr. Jacobs stated that, speaking generally, while he found the mining industry progressive in the districts he visited, particularly in connection with the operations of several of the larger and well established companies, some of the statements he had lately seen published in provincial newspapers to the effect that numbers of new properties, or old ones that had lain idle for a long time, were now being worked, or are about to be, are not warranted by the facts of the situation. Further, the assertions relative to a prospective "boom" in mining, at any rate in the districts he visited, were, in his opinion, simply the loose talk of men not well informed on this question. The Slocan district, for instance, has been the subject of much misrepresentation, and one result has been that many men have gone to it expecting to find work at one or other of the mines, but have been sorely disappointed, there having already been more men in the several parts of the district awaiting work than employment was being found for. This is not saying, however, that mining is not progressive in parts of the Slocan, for the position certainly is more satisfactory and promising, on the whole, than in a number of past years. Similarly, in Ymir, Sheep Creek and Rossland camps, not



**Copper Moulds, Granby Smelter, Grand Forks, B.C.**

disturbance in that State. In the greatest number of oil fields, the elongation of the different pools or fields, all in one direction, clearly demonstrates that they are connected with fissuring and faulting.

I believe it is unnecessary to prolong this discussion and to take up Dr. v. Hofer's remarks on the objections advanced by me in my paper, *Petroleum and Coals*, to the theory of organic origin, as I consider that these objections still stand and have not been sufficiently answered. Most of these points are also covered by my remarks in this discussion, or in my new paper, read at the same meeting of the Institute with Dr. v. Hofer's, and written before I had seen the latter.

#### **NOTES ON MINING IN WEST KOOTENAY AND BOUNDARY DISTRICTS OF BRITISH COLUMBIA.**

At the end of June, Mr. E. Jacobs returned to Victoria, B.C., after an absence of six weeks, the greater part of which period was spent in West Kootenay and

only is there activity at most of the best known mines, but in a number of instances the outlook is decidedly better, owing to development of important ore bodies, and to preparations being made for the mining and reduction of ore on an increased scale.

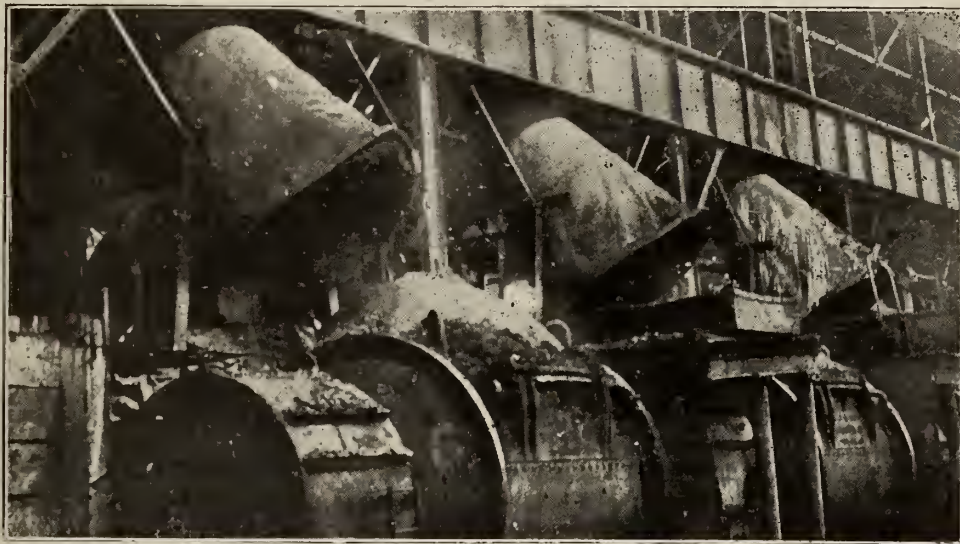
Leaving Victoria on May 13, Mr. Jacobs went via Seattle to Spokane, and thence to the State College of Washington, Pullman, where he attended a meeting of the Columbia local section of the American Institute of Mining Engineers, and where, as the guest of Prof. F. A. Thomson, he saw much of the mining engineering department of the college, of which Mr. Thomson is the head. Local sections of the electrical and civil engineers of Spokane and district, respectively, also held sessions at Pullman at the same time, so that altogether the gathering was a large and important one.

Going thence to Nelson, B.C., a week was spent in the chief city of the Kootenay, in connection with a meeting of the Western Branch of the Canadian Mining Institute, which was fairly well attended, three sessions having been held and interest in the proceedings maintained throughout.



As to mining in Nelson division—in the near vicinity of the city, several mines that had been worked were idle for the time being, and there was no immediate prospect of a resumption of operations; these were the Granite-Poorman group and two mines that the British Columbia Copper Co. had been working. On the other hand, the Consolidated Mining and Smelting Co. had gradually increased the output of ore from the old Silver King mine, and was just resuming operations at the Molly Gibson, the latter having been closed during several winter months, when the snow at the high altitude of the mine was too deep for safe working. About Ymir, the Wilcox, Dundee and Yankee Girl are all in a better position as regards the quantity of ore developed than for a number of years, so that when finances shall have been arranged they will doubtless be profitably productive for a comparatively long period. Again, in the Salmo-Sheep Creek portion of the Nelson division—lead ore is being shipped in larger quantity from the H. B., Zintcon, and

Rambler-Cariboo mine and mill, with a two years' ore supply estimated as being available. Ore of good grade and in quantity had been found on the bottom level of the Slocan Star mine and the concentrating mill was being prepared for operation after an idleness of probably eight years; and, as well, ore shoots had been opened on other levels above the tenth. Ore had been found on the Wonderful property, after a year's search for it. The Ruth-Hope and the Richmond-Eureka mines were being worked. Exploratory work at considerable depth was being continued in the Payne mine, though no commercial ore had yet been found. On the Noble Five group, Cody, important development work was in progress, and in the neighboring Surprise mine much ore had been opened and that found suitable for shipment was being sent to the smelter at Trail. In the vicinity of Silverton, the Standard silver-lead mine looks remarkably well, with large reserves of ore available and mine and concentrating mill being worked to full capacity. The Hew-



Converters, Granby Smelter, Grand Forks, B.C.

Emerald mines, while the Motherlode mill is again at work, on the gold ore mined during the winter, and there has been opened on the 600 level of the Queen mine as unusually large shoot of gold-bearing ore—from 20 to 30 ft. wide along a proved distance of 60 ft.—of good value and which is returning considerable profit to the owning company. In Erie camp, too, there is improvement, for United States men have provided sufficient money to keep the Second Relief going throughout the year.

Ainsworth camp was found to be in a more prosperous state than for a number of years, chiefly as a result of the operations of the Consolidated Mining and Smelting Co., which is operating four mines, while Spokane men are working three properties in the northern end of the camp with good prospects of success. The payroll of this old established camp—it dates back to the eighties of last century—including the Bluebell mine and concentrator across Kootenay lake from Ainsworth, now numbers more than 300 men and the monthly disbursement of wages is estimated at about \$30,000, while the prospects appear favorable for further extension of operations and production.

In the Slocan there was found much indicating substantial progress. Work had been resumed at the

itt-Lorna Doone, in the same camp, will shortly join the important producers, for preparations to mill about 150 tons of ore a day are about completed, and there is much ore ready for extraction. Beside these large mines, a number of smaller ones in various parts of the Slocan are also being worked, and these latter contribute in degree to the activity characterizing mining in the district.

At Trail and Rossland, more, perhaps than elsewhere in the Kootenay, is evident the progress that is being made in connection with the mining and smelting of ores. Further important improvements to smelting plant are being made at the Consolidated Co.'s works at Trail, noticeably in new lead and copper blast furnaces of modern design and enlarged smelting capacity, while all through the works betterments are still being made to provide for expeditious and economical handling of ores and smelter products. Near Rossland, the chief mines are known to have large reserves of ore opened, and the prospects for permanence and prosperity are consequently much better now than, say, ten years ago. A ride on an electric locomotive for three-quarters of a mile from the Centre Shaft to one of the working faces of the War Eagle mine, and a sight of the masses of good looking ore at that consid-



erable depth, impress the visitor with the bigness of this mine and make him prepared to believe that there are still millions of dollars worth of ore in Red Mountain mines, even though approximately \$60,000,000 worth has already been taken out. Then, when he is taken to another working face, on the War Eagle sixteenth level, nearly 2,000 ft. from the Centre Star shaft, also on an electric locomotive, he begins to be bewildered with the thought of the immense potentialities of these Rossland mines. And these notes leave out of present account the ore bodies opened on the neighboring Le Roi and Le Roi No. 2 mines, both of which have known shoots of ore of good grade opened from the 1,650 ft. level.

In Boundary district, the big copper mines are continuing to produce well on to 5,000 tons of ore a day, and the smelting works of the Granby and British Columbia Copper companies to reduce it and extract its valuable contents. Among the smaller properties, the Jewel gold mine, near Greenwood, continues to do well, making a profit and opening ore at greater depth than was formerly done, while, up the north fork of Kettle river, the Union is a shipper of ore of comparatively high grade, and other properties are being prospected. Space limits prevent more being told of progress, but the foregoing notes will serve to indicate that mining is really progressive in the several districts mentioned.

#### RAMBLER-CARIBOO MINES, LIMITED.

The annual general meeting of shareholders in the Rambler-Cariboo Mines, Limited, was held at the company's office, near Three Forks, B.C., on June 9. There were represented in person and by proxy 1,007,418 shares out of a total of 1,750,000. Among those present were five directors, namely, Mr. Alfred Coolidge, of Spokane, Washington, vice-president and secretary-treasurer, in the chair; Dr. B. W. McPhee, Spokane; Dr. John Benson, Colfax; Dr. Johnston Armstrong, Tacoma; and Rev. P. F. Hylebos, Tacoma. Dr. J. F. Hall, of Spokane, was also present. Mr. A. E. Cable, in charge of the company's office near Three Forks, assistant secretary, presented a statement of receipts and disbursements during the fiscal year, ended April 30, 1914, and a balance sheet at end of same period. A report of development work done in the mine and of conditions at mine and concentrator, was submitted by Mr. J. E. Rinta, manager.

From the statements of account it was learned that the company's indebtedness on bills and accounts payable, which, on April 30, 1913, was \$81,434.04, had been reduced by \$55,334.04, and at the end of the fiscal year now under review stood at only \$26,100. In addition to this reduction of indebtedness, a liberal amount had been written off mine and mill equipment and aerial tram accounts for depreciation.

Development work done in the mine totalled 669 ft., this consisting of drifting on the 8, 10, 12, 13 and 14 levels, and raising to the 13, 10, and 8 levels. There was shipped to Trail, B.C., 2,508 tons of silver-zinc concentrate. The valuable metal contents of the lead concentrate were 174,799 oz. of silver and 1,706,585 lb. of lead. The zinc concentrate contained 31,066 oz. of silver and 883,018 lb. of zinc.

Mine and mill were closed during the months of February and March; work was resumed in the mine about April 1 and at the mill three weeks later, but no shipments of mine or mill products were made during those three months.

Accounts and report were adopted. The directors were re-elected with the exception that Mr. C. L. MacKenzie was chosen in place of Mr. Harry Cornwell. The board as now constituted consists of the following directors: Mr. A. F. McClaine, Spokane, president; Mr. Alfred Coolidge, Spokane, vice-president and secretary-treasurer; Dr. B. W. McPhee, Spokane; Dr. John Benson, and Mr. C. L. MacKenzie, Colfax; Dr. Johnston Armstrong, and Rev. P. F. Hylebos, Tacoma. Mr. A. E. Cable continues as assistant secretary and Mr. J. A. McPhee as assistant treasurer.

Two of the directors went up to the mine and were shown through it by Manager Rinta. On their return they reported to the shareholders meeting very favorably on what they had seen, and expressed confidence in the profit-earning future of the property. Present force of men on the payroll—mine and mill—numbers about 70. It was mentioned that a Hardinge conical mill had been added to the mill equipment, and that it is intended to put in two more James concentrating tables.

About three months ago the directors issued to the shareholders a printed review of the company's affairs and position at that time. The following are excerpts from it:

"Since the annual report of 1912 we have completed the new concentrator at an additional cost of \$35,807.82 and the aerial tramway at \$18,073.38, both of which are operating successfully, as shown in the manager's report. Have also built office, assay house, and new boarding and bunk-houses at the mill, and some new houses at the mine. We have purchased additional ground and paid for same to the extent of \$11,000. We have store supplies and explosives to the approximate value of \$2,200.

"The board expects to carry out the suggestions made by the manager as to careful and economical management, and in this connection we desire to say that there are no salaries paid to any officer or director who is not rendering actual service at the property.

"At the last annual meeting the board authorized a quarterly visit of one of its members to the mine, and since that date two such visits have been made, and brief reports of its condition submitted. We believe that these visits should be continued, as they are productive of good."

Under date, February 15, the manager, Mr. J. E. Rinta, submitted the following report:

"On account of the shortage of water, making it impossible to operate the mine properly, I have decided, as advised you some days ago, to close down until such time as sufficient water shall be available for ample power.

"The development has been continued, and at present we have in our reserves more ore than was shown at the time of my taking charge in June, 1913, and there is now, in my opinion, sufficient ore in sight to keep us continually operating for the next 24 months, and during that time additional ore should be found. I feel certain that the coming year's results will give larger profits than those of last year. The ore bodies in the mine are not large and continuous, but rather small and of higher grade, varying as to size and quality between different levels, and this makes it very difficult to give close estimates as to quantity in sight. When working in swells we are too apt to conclude that we have more than proves out, and again, on lean levels we find the contrary condition. However, it requires at all times careful and economical management



to obtain fair net profits. At the present time we are getting out considerable clean ore from several different places in the mine, and we have every reason to believe that my estimate of better net results for the ensuing year will be verified.

"The mill and the aerial tramway are working satis-

factorily, and there does not appear to be any difficulty confronting us other than shortage of power. As soon as there shall be sufficient water available for power purposes we will resume work in the mine and at the mill, and thereafter will push the work as rapidly as shall be consistent with economy."

## A BRIEF COMPARISON OF METHODS AND CONDITIONS IN THE WITWATERSRAND AND LAKE SUPERIOR DISTRICTS\*

By L. D. Hingle.

The Witwatersrand, commonly called the "Rand," is a ridge projecting slightly from an elevated plateau, 6,000 ft. above the sea level. It consists of several series of conglomerate beds interbedded with quartzite-sandstones and arranged in planes more or less parallel to each other and overlying a huge granite deposit. The term "banket" has been applied to these conglomerates, owing to their similarity in appearance to an almond sweetmeat of that Dutch name.

Five series of conglomerate beds are generally distinguished, but up to the present the only one of importance is the Main Reef Series, prospecting on the others having proved that while gold is an essential

On the Central Rand the beds dip south, at an average angle of 50 deg. They flatten noticeably with depth, however—at 3,000 or 4,000 ft. often to 30 deg.

On the East Rand, however, the continuity of the beds is hidden by coal measures, and their position complicated by numerous igneous overflows and intrusions. The Main Reef Series has been picked up here after a break of three miles, and the dip is found to be much flatter, getting to 8 deg. in some mines. A great thickness of overlying coal measures in this region causes some companies to sink vertical shafts 3,000 ft. deep before striking the gold-bearing conglomerates.



Skips and Man Car, Calumet and Hecla Mine, Michigan

constituent of all of them, they are generally unpayable. This Main Reef Series, which is near the base of the Witwatersrand beds, produces the great bulk of the gold output of the Transvaal. The Witwatersrand beds appear to form two definite synclines, but mention will be made only of the Witwatersrand or Northern syncline, as this is the important gold carrier.

The outcrop of the series takes roughly an elliptical shape, with its major axis extending in a N. E. by E. and S. W. by W. direction, this axis being 130 miles long. The minor axis is practically at right angles to this, and 60 miles long. Most of the gold, however, is obtained in a central portion of the series, 60 miles long extending about 30 miles on each side of Johannesburg.

The gold-bearing beds do not have a uniform outcrop, but dislocations in some localities, and concealment beneath different deposits in others, naturally divide the area into districts.

The West Rand also has been cut off from the Central Rand by means of a huge fault; but here, as at Randfontein, the conglomerate outcrops, and dips at a very steep angle, 80 deg. or over.

Hence it will be seen that the banket is mined on the Rand at practically any angle, which gives rise to vast differences in mining methods employed there.

The ultimate vertical depth to which mining will be carried on the Rand has given rise to much discussion. Those companies mining areas within whose limits the banket outcrops, are known as "outcrop" companies. Companies owning areas to the dip of these "outcrops" are known as the First Rows of Deep Level companies. To the dip of these "Deep Levels" are the Second Row of "Deeps," and so on. At present only one company, the Turf Mines, is operating on the Fourth Row of Deeps, and in consequence in very heavy ground.

Mining engineers on the Rand are now discussing possibilities of working at 8,000 ft. depths and over

\*From the M. C. M. Alumnus, April 14.



(vertically), since values found at depth are still most favorable. A typical case is that of the Cinderella Consolidated, which on its fifth level, 4,440 ft. vertical depth, has developed 1,530 ft. along a drift, and obtained an average gold assay of \$9 per ton, over a width of 42 in., which is very good. Many other deep-level mines have obtained equivalent or better values at nearly the same depth. The average value of rock hoisted from a good mine on the Rand is \$8 a ton.

In comparing the Rand banket with the Copper conglomerate in the Superior district, a few prominent points may be mentioned. The dip of the two beds is often alike, but the stoping width in the Rand mines is generally smaller than in the Copper country mines. While the pebbles in the copper conglomerates are

The Witswatersrand appears to be much harder for drilling, and the matrix is not at all loose or friable, as is sometimes the case with the copper conglomerate. The ore of the banket is so hard that lumps of it of suitable size, say roughly 4 in. in diameter, have displaced all flint or other pebbles for grinding the ore in the tube mills, and a piece of banket will take a beautiful polish when ground into a spherical shape, the matrix remaining in position as well as the pebbles.

In connection with shaft sinking on the Rand, it is very rare to find an inclined shaft sunk on the conglomerate bed, unlike the practice in some of the copper mines in this district. Practically all the shafts are sunk in the footwall, and crosscuts driven over to the ore body. In one particular shaft on the East Rand, which has been sunk some 4,000 ft. on the con-



**Drilling by Mounted Hammer Drill in a Lake Superior Copper Mine**

Photo furnished by P. B. McDonald

mostly reddish or brownish felsites, or sometimes quartz porphyries, those in the gold banket are chiefly of white, sometimes black, quartz. They are also more rounded, smaller and more uniform in size than the pebbles of the copper conglomerate, and lie parallel to the bedding.

The matrix, or cement, binding the gold conglomerate pebbles together is mainly of siliceous and chloritic material, generally containing iron pyrites. The gold is generally found surrounding the pebbles, almost invariably in the matrix, in a manner remarkably similar to the occurrence of the copper in the Lake Superior district, although it is sometimes found along slips and cracks in the pebbles, but rarely visible to the naked eye.

glomerate, an almost unbelievable warping has taken place, which has resulted in the condemnation of the shaft. Looking up toward the surface from an open skip some distance down the shaft, one sees the track take on the form of an ideal switch-back railway, and all this notwithstanding substantial pillars left on each side of the shaft.

Practically all large mines on the Rand make use of large shaft bins or pockets from which the broken ground is loaded into the skip, and it is very rare to see a car underground being tipped direct into a skip, as in many of the copper mines in this district. The Rand method appears to economize in time of loading skips, and also provides a supply for winding if anything is hung up in the mine workings.



Auxiliary shafts are being put down largely on the Rand. An inclined shaft some 4,000 ft. or more in depth may be put down a short distance behind the banket head. A cross cut is then put due south, toward the conglomerate, and a second inclined shaft is started from a point a little above the level of the bottom of the first or main shaft. It will be seen that this auxiliary shaft is also in the footwall, as the bed often flattens out in depth. A chamber is cut out for an electric hoist, which is always put on the footwall side behind the shaft, on solid ground. The auxiliary shaft

Lake Superior district slopes, most of the mines on the Rand employ 200 ft. or longer backs, and in some of the flatter seams on the East Rand, there may be 1,000 ft. of banket between two adjacent levels.

While the overhead method of stoping is generally employed in the copper mines, both overhand and underhand methods are employed on the Rand, and a third method, known as "cliff" stoping, a combination of the two, is also in use now.

In stopes where the dip is too flat for the ore to gravitate down to the chutes, mechanical shakers are



**Drilling with Jackhammers, Witwatersrand Mine, Transvaal**

—South African Mining Journal.

often has four compartments of exactly the same dimensions as the main shaft, and crosscuts are driven south to tap the conglomerate bed as before. All ground hoisted in the auxiliary shaft is dumped into a chute which leads to a pocket in the main shaft, from which it is hoisted without further handling.

The auxiliary shaft thus serves three chief purposes: It obviates the necessity of having one very deep shaft, when the length of the winding rope would be a source of trouble; it saves money in that short crosscuts are necessary to tap the bed from the auxiliary shaft; and finally, it is unnecessary to change the dip of the main shaft, in order to follow more closely the ore body which is flattening away from the shaft.

While 100 ft. backs are generally carried in the

employed in the Witwatersrand mines. These are semicircular steel troughs suspended from the hanging, and reciprocated by means of a small compressed air engine in the stope, the trough being arranged to dip toward the level below. Natives shovel broken ground into this shaker, which transports it direct to cars below, saving much work in the stope.

Comparatively little timber is used to support the hanging on the Rand mines, but a system of sand-filling has been introduced. Damp sand is taken and mixed with water to form a pulp. It is then made alkaline and some permanganate is added to destroy the cyanide remaining in the sand from previous treatment. The pulp is then sent underground through boreholes or old shafts, the boreholes not being lined.



The pulp is then led along the footwall of old stopes, or along V-shaped launders and distributed to any part of the mine. The launder has a 9 in. side, and the necessary dip is about 15 deg., and such a launder will handle 1,000 tons in 10 hours.

When a worked-out stope is to be filled, the bottom of the stope is boarded off, and the cracks filled with matting or veldt grass. The pulp is led into the stope and water allowed to drain off through bungholes in the barricade into a launder in the level below. The sand then consolidates and forms a rigid support, and two days after filling, it is possible to put a raise up through it; a good native will advance 12 ft. an hour, keeping against the hanging wall.

Sand is not only used for filling old stopes, but also in connection with reclaiming old pillars and bad ground. The workings around the pillars are filled with sand, and the pillars can be removed with safety.

Much trouble has been caused on the Rand by "air blasts," and much debate has arisen regarding their origin. In one particular case in an East Rand mine, a drift 7 ft. high had been driven along the bed at a depth of 3,000 ft. One day, without warning, the drift practically closed up, with the shock of a miniature earthquake. The track was found near the hanging wall, having been elevated 5 ft. or more for quite a distance along the drift. Frequently lumps of conglomerate fly off from the face with considerable velocity, and often cause loss of life; pillars sometimes act similarly. These large "air blasts" have occurred chiefly in zones of known weakness, where considerable faulting has taken place, and the general opinion among engineers on the Rand is that pressure is the sole cause.

The natural ventilation of the mines in the Superior district seems very efficient, as the mine air is undoubtedly good. On the Rand, with its dust problem and high altitude, artificial ventilation generally has to be resorted to, and in most of the big mines powerful fans are installed.

The underground sanitation methods enforced on the Rand by Government regulations are probably more efficient than those found in this district. The Government's regulations as to underground conditions in the gold mines are most complete, and an efficient body of mine inspectors see that the regulations are carried out.

Practically every Rand mine has two distinct systems of electric bell signalling in use, and for very deep shafts electric signalling appears to compare favorably with the methods of hand signalling commonly employed in the Superior district.

The great contrast between the two districts lies in the type of unskilled laborers employed. Practically all unskilled labor on the Rand is performed by the negro, whose average wage is equal to about 50 cents a shift of 8½ hours. The higher rate of wage paid to skilled workmen in the Rand mines, and the expensive amalgamation and cyanidation methods necessary to extract the gold from the banket, bring the working costs on the Rand probably far above those of the Superior district.

As a point of interest in conclusion, it may be mentioned that diamonds have been found in the Rand banket. One company on the West Rand actually started up as a "Gold and Diamond" proposition, but only succeeded in obtaining a few diamonds in the mortar box. One or two diamonds were found on the Central Rand, and recently one was found in the far East Rand.

## CALUMET AND HECLA.

President Quincy A. Shaw says of the strike in Michigan which was called off on April 12, 1914:

"The strike was called July 23 last by the Western Federation of Miners, an organization with headquarters in Denver, Colorado. Less than 15 per cent. of the employees joined this union, and many of these were forced to join by intimidation.

"This organization entered the community with a notorious record of brutality, disorder and crime extending over the past twenty years. The strike was inaugurated with the same brutality, disorder and crime and attempts by violence to prevent the great majority of the employees from continuing work. During the strike more than 95 per cent. of the employees, by signed petitions, asked the management not to recognize this organization nor to employ its members.

"The public opinion of 90,000 inhabitants of the copper country, repeatedly expressed in public meetings, representing every class of employment and business, emphatically disapproved the introduction into the community of an organization whose history, principles and recent performances make it a continuous menace to the peace and prosperity of the country. Your management has felt it to be its duty to its loyal employees, to the community and to its stockholders to refuse to have any dealings with this organization and to refuse to employ its members.

"During the strike this company was singled out from among the other companies of the district as the object of attack by the officers of the Federation and other agitators. All sorts of inaccurate and malicious statements as to conditions, wages and hours of work were spread broadcast throughout the country despite the fact that the most casual examination would show that for years the conditions were better and wages higher at this mine than at any other in Michigan. This campaign of misrepresentation was aided and abetted by the officers and leaders of many of the labor organizations throughout the country; by unprincipled politicians and by many newspapers and magazines that have continued to publish sensational articles without reference to the facts.

"In view of the misstatements that have appeared in print as to the wages of underground men and as to the general conditions, the following information may be of interest to stockholders:

"Average net wages for six months prior to strike, miners, \$3.59; trammers, \$2.97.

"An eight-hour shift has been in force since December 1 in the mines and mills and for men engaged in work that is continuously conducted; a nine-hour day applies to all surface and shop work. The company owns 903 houses, which are rented to employees at about \$1.00 per room per month; this includes all repairs and removal of garbage. All houses have running water and the large majority have stone or concrete cellars. The company also leases at \$5.00 per year 969 lots on which men have built their own houses. Married men pay \$1.00 and single men 50 cents per month to the hospital. This entitles them and their families, without further charge, to medical and surgical attendance and medicines. The company provides pensions for certain of its old employees in consideration of long and faithful service.

"This company has never owned, had any interest in, or operated a 'company store.' This is equally true of all the mining companies in this district in which this company is a stockholder."



# THE OCCURRENCE OF PETROLEUM AND NATURAL GAS IN THE MID-CONTINENT FIELD\*

By Chas. N. Gould.

The Mid-Continent oil field, as the term is generally used, includes an area approximately 200 miles long from north to south, and 100 miles wide, located in southeastern Kansas and eastern Oklahoma. The limits of the productive field have not yet been sharply determined, and probably will not be for many years. The most northern point at which oil has been found in quantity is near Paola, Kansas, some 50 miles southwest of Kansas City. The most southern point is near Coalgate, Oklahoma. The southeastern part of the Mid-Continent field extends from Oklahoma into the vicinity of Fort Smith, Arkansas. The westernmost limit, as at present developed, is at Blackwell, Kay County, Oklahoma. The area within which oil and gas have been found in commercial quantities contains approximately 20,000 square miles.

The rocks in which the hydrocarbons occur throughout the two states, consist entirely of sediments of Pennsylvania age which lie, usually unconformably, above the Boone chert, a limestone of Mississippian age. This limestone, popularly known to the oil men as "the Mississippi Lime," outcrops in the region east of Grand river, in northeastern Oklahoma and southeastern Kansas. The Pennsylvania formations, as exposed in the Mid-Continent field, consist of alternating sandstones, shales and limestones with an occasional bed of coal. Throughout northern Oklahoma and Kansas the Pennsylvanian rocks dip west at rather constant angles, varying from 50 ft. to the mile near their eastern exposure, to less than 20 ft. to the mile in the western part of the area. In the southern part of the Mid-Continent field the rocks have been folded into a series of anticlines and synclines.

## Oil Sands.

The petroleum and natural gas found in the Mid-Continent field occur altogether in ledges of sandstone which occur interstratified with shales and limestones. In the great majority of cases the stratum lying above the oil-bearing sand, that is to say, the cap rock which holds the oil down, is shale; but in a few instances it is limestone. All the oil sands in the Mid-Continent field are more or less lenticular. Some of the more persistent of the sands, as for instance the Bartlesville sand, and the Wayside sand are believed to occupy an area of several thousand square miles, while others are but a few square miles in area. Even the most persistent of the sands, however, often vary much in thickness, even in short distances.

## Pools.

The term "pool" is applied to a small area from which oil or gas has been produced. The size of a pool in the Mid-Continent field varies from a fraction of a square mile to several square miles. For instance, the Flat Rock pool, near Tulsa, Oklahoma, is two miles long and one mile wide. Glenn pool is twelve miles long and five miles wide. Hamilton Switch pool occupies less than a square mile. The size, shape, and location of the various pools in different parts of the Mid-Continent field differ materially. At the present time there are more than 80 separate pools and new ones are constantly coming to light.

In many of the pools throughout this region, there is but one producing oil sand, while in others there are several sands. For instance, in the vicinity of the world-famous Glenn pool, which during the past six years has produced 120,000,000 barrels of oil, there are four producing sands known as the Red Fork sand, which lies at a depth of 1,300 ft., the Glenn sand at 1,500 ft., the Tanaha sand at 1,700 ft., and the Dutcher sand at 2,200 ft. In the Bartlesville field there are eight productive oil sands.

In some parts of the Bartlesville region as many as four sands have been found productive on the same property, and it is a common occurrence for two of them to produce oil. In the Cleveland field there are five producing sands, in the Cushing field five, and in the Ponca City field seven sands that produce oil or gas in commercial quantities.

As has been stated above, all the sands in the Mid-Continent field are more or less lenticular, and often thicken and thin rapidly in short distances. Not enough drilling has yet been done throughout the region to demonstrate with certainty the continuity of the various sands. To cite a specific example, most oil men and most geologists who have studied the conditions now believe that the Bartlesville sand, which has produced such immense quantities of oil in northern Oklahoma, extends uninterruptedly from southern Kansas through Washington and Osage counties, Oklahoma, as far as the Bird creek and Flat Rock fields, near Tulsa. The same sand is also supposed to occur at Cleveland. In other words, the Bartlesville sand is commonly believed to be continuous over more than 5,000 square miles.

In point of fact, however, no one knows with certainty that this is true. It is not possible in the light of present knowledge to either prove or disprove the assertions. No one can be certain that the sand which contains oil or gas at a depth of about 1,100 ft. near Independence, Kansas, is the same sand which contains oil at 1,200 ft. at Bartlesville, at 1,300 ft. in the Flat Rock field, near Tulsa, and at 2,400 ft. at Cleveland. Sufficient investigations have been made, however, to demonstrate with approximate certainty the oil-producing sands in these four widely separated localities, occurring at the depths mentioned, are situated at about the same geological horizon. Taking into account, however, the known lenticular nature of all the Pennsylvania sands in the region, it is as yet too early to make a definite prediction as to the continuity of this or, in fact, of any other sand in the Mid-Continent field. It is quite possible that further development will show that various lenticular sands appear and disappear throughout this region, and that the Bartlesville sand, so-called, is by no means continuous.

## Factors Governing Accumulation.

The two dominant factors which appear to govern the accumulation of petroleum and natural gas in the Mid-Continent field are: (1) The thickness of the oil sands, and (2) The structure of the rocks.

It goes without saying that, other things being equal, the thicker the sand, the more oil will be contained

\*Extracts from a paper read at the International Geological Congress, Toronto, Aug., 1913.



therein. The Glenn pool, one of the most noted in the world, owes its prominence largely to the fact that the Glenn sand averages from 75 to 100 ft. in thickness at this place, thus providing an immense reservoir for the storage of petroleum. The Bartlesville sand averages from 50 to 60 ft. thick, and scores of millions of barrels of oil have been produced from it. The Cleveland sand, which is also a thick sand, has produced a vast amount of petroleum.

On the other hand, many sands, as for instance the Wayside, Peru, Childers, Alluwe and others, which average 20 to 40 ft. in thickness, have produced smaller amounts of oil. Generally speaking, the wells in the thicker sands have initial productions varying from 100 to 1,500 barrels of oil per day and settle after two to three years to 20 to 100 barrels per day. The wells in the thinner sands usually have initial productions of from 30 to 200 barrels per day, and settle to 5 to 20 barrels per day. Thus it will be seen that, other things being equal, it is very much more profitable to operate the thicker sands. It must be remembered, however, that the thinner sands are often comparatively shallow, occurring at depths of from 300 to 1,000 ft., while the thick sands usually lie at depths varying from 1,200 to 3,000 ft. beneath the surface.

The usual cost of drilling a well to the shallow sands, where an initial production of 50 barrels a day may be expected, varies from \$1,000 to \$3,000, while wells 2,200 ft. deep in the Cushing field, where the initial production averages 500 barrels per day, cost from \$8,000 to \$12,000 to drill and equip. It will be understood that in case any considerable number of unproductive wells occur in the region of deep sand the operation may be at a loss, but in case the wells encounter large amounts of oil, the operation is extremely profitable. The general experience throughout the field has been that operation in the thinner sands in the shallow fields is a far safer investment, while the operation of the deep sands is more speculative, but with the possibility of very much larger profits.

A second factor which governs the accumulation of oil in the Mid-Continent field is that of the structure of the rocks. Throughout the greater part of this region the general structure is that of a broad monocline. The normal dip of the rocks is to the west, decreasing from 50 ft. to the mile near the eastern outcrop of the Pennsylvanian series, to 20 or 10 ft. to the mile in the western part of the Mid-Continent field. In many places, however, this western dip of the rocks has been interrupted by local folding. These folds are usually not strongly marked, and in fact are often inconspicuous. In many, perhaps most, cases the folds are in fact nothing but terraces, or "arrested anticlines." That is to say, the rocks in certain localities, instead of having the normal dip to the west, lie nearly level. In comparatively few places throughout the greater part of the field, may well-marked eastern dips be observed.

Careful studies of geological conditions have demonstrated that there is in the Mid-Continent field a rather definite relation between structure of rocks and occurrence of oil and gas. Those who are considered to be the best authorities on the subject do not hesitate to say that, so far as observation goes, practically every oil pool in the Mid-Continent field may be accounted for by structure. It must be admitted, however, that it is not always possible to determine this structure from surface observation, so that a careful study of well records is often necessary to determine it; but,

when once understood, the relationships between structure and production are usually obvious.

In the southern part of the area occupied by Pennsylvanian rocks, that is to say, in the region from Muskogee southwest to Atoka, and southeast to Fort Smith, Arkansas, the general western dips noticed farther north give way to a series of alternating anticlines and synclines.

There has been no great amount of drilling in this region, and very little petroleum has so far been found therein. It is, however, a very significant fact that, throughout this region, in practically every known case where drilling has been done along anticline folds, natural gas has been found. The gas fields near Fort Smith and Manfield, Arkansas, and near Poteau, Spiro, Kinto, Red Oak and Wardville, Oklahoma, are located on or near the axis of well-marked anticlines. Up to the present time not enough drilling has been accomplished, throughout this part of the Mid-Continent field, to demonstrate the absence or presence of oil in quantity. It is altogether probable, however, that extensive operations will reveal the presence of considerable amounts of petroleum.

#### **Relation between Sands and Structure.**

Within the developed portion of the Mid-Continent field where, as stated above, the anticlines are not so conspicuous as in the regions just discussed, the largest oil pools almost invariably occur where an unusually thick sand underlies an anticlinal fold, or a terrace. The Bartlesville, Glenn, Cleveland, Cushing, and in fact all the larger pools that have produced unusually large amounts of petroleum, contain this very favorable combination of thick sand and structure. In many instances, however, oil has been found in considerable quantities in regions where there is little or no evidence that the normal western dip of the rocks has been interrupted. Under such conditions, however, the drill reveals the fact that the oil sands are unusually thick. Instances of this kind occur in certain parts of the Bartlesville pool, in the Bird Creek pool, in the Shallow field, and in many of the pools in the Osage Nation.

#### **Future of Mid-Continent Field.**

There is no means of knowing accurately the possible extent of the Mid-Continent field, but, taking into account all the available data, including the stratigraphy and structure of the rocks, and the known occurrence of oil and gas under existing conditions, it may safely be estimated that, at the present time, not over one fourth of the future available territory in Oklahoma and Kansas has yet been drilled. New fields are constantly coming to light and the limits of old ones are being extended.

Many of the wells now in operation have been producing oil for fifteen years, and are by no means exhausted. At the present rate of development, it will be many years before the productive area of the fields has been determined. It will be many more years before it all will be drilled. There need be no surprise if the Mid-Continent field is producing both oil and gas one hundred years from this date.

#### **COAL CUTTERS.**

The Sullivan Machinery Co. has just published a bulletin describing two new machines: the CE-7 Iron-clad coal cutter and the CH-8 Longwall coal cutters. Another recent bulletin describes rock drill mountings and equipment. A booklet on "Core Drilling by Contract" has also been recently issued by the Sullivan Company.



## BY-PRODUCT COKE OVENS OF THE ALGOMA STEEL COMPANY, SAULT STE. MARIE, ONT.\*

By W. J. Dick.

The coal used for making blast furnace coke must be a good coking coal, low in sulphur, and fairly low in ash. The West Virginia and Pennsylvania are the only coals in the middle and eastern states possessing these requisites; consequently these coals are used in all the great iron manufacturing centres east of the Mississippi valley.

The Algoma Steel Company imports coal from two localities, and mixes them prior to coking. The coals are: (1) Cannelton (Kanawha coal, northern West Virginia), a coal containing a high percentage of volatile, combustible constituents and analysing, proximately: Volatile, 34 per cent.; ash, 6-8 per cent.; and (2) Pocahontas coal (southern West Virginia), low in volatile, combustible constituents, and analysing, proximately: Volatile, 19 per cent.; ash, 6½ per cent.

The coal is shipped by rail to the Lake Erie ports—Toledo or Sandusky, Ohio; thence by water to the Company's docks at Sault Ste. Marie, Ont.

The coal is unloaded from the vessels by means of two electrically operated steel towers with a capacity of 180 tons per hour each! 9,500 tons have been unloaded from vessels in 34 hours working time. The labor employed on each tower consists of one man to operate the hoist.

The coal is hoisted from the vessel by means of a 3½-ton bucket and is then dumped into an 80-ton hopper situated on the tower. It is discharged from the hopper into an electrically operated 20-ton car, and is then either conveyed, by means of this car, direct to the hopper that supplies the Bradford breaker, thence to the coke ovens, or carried to the stock pile, where it can be dumped on either side of the track by means of the air lift door, depending, of course, on whether it is Pocahontas or Cannelton coal, the two varieties of coal being kept separate on the stock pile. The 6½-ton bucket suspended from the travelling bridge distributes the coal on the pile. About 1,560 tons of coal is used per day to supply the coke ovens.

The coal is loaded from the stock pile, by means of the bucket and bridge mentioned above, and is dumped into a 20-ton electrically driven car which carries the coal to a hopper. From the hopper the coal is then elevated by means of an endless belt to the Bradford breaker. The Bradford breaker consists of a revolving horizontal steel screen, in which the perforations are about 1½ in. in diameter, and which is fitted with radial shelves. These shelves pick up the coal and drop it, crushing it by its own weight. Short deflecting plates cause the oversize to discharge into a 30-ton railway car. The undersize goes to a mixing bin.

The two varieties of coal are kept separate and stored in separate bins of a capacity of 100 tons each. The coal from the two bins is mixed together in the proper proportion, namely, 60 per cent. Cannelton and 40 per cent. Pocahontas coal, by means of adjustable feed hoppers, situated on the outlets of the bins, and by revolving belts.

From the mixers, the coal passes through two magnetic separators which remove pick-points, or other iron or steel ingredients. It then goes to two Williams disintegrators.

In most by-product plants 75 per cent. of the coal must pass through a ⅛ in. screen. The practice at this plant is to mix the coal so as to give 60 per cent. Cannelton and 40 per cent. Pocahontas coal.

The structure of coke is affected by three factors, viz: The chemical composition of the coal itself; the rapidity of burning; and the fineness of the coal charged into the ovens.

In this plant, all these factors can be adjusted by means of the variable feed, the crushing of the coal, and the firing of the ovens. In general, it may be said that very low volatile coal tends to merely sinter together if heated very slowly; on the other hand, if heated rapidly, fusion is completed.

The degree of the fineness of grinding primarily determines the size of the slate or bone which may be in the coal. After coking, the slate or bone, which keeps its size and shape, causes cross checking; hence, if the grinding is coarse, a friable coke is obtained. Notwithstanding this cross checking, however, the internal structure of the coke is the same, whether the grinding be coarse or fine.

From the crusher, the coal is carried by endless belt to a 2,000-ton storage bin, which is situated over the centre of the two batteries of ovens. The bin is fitted with three sets, of 4 hoppers each, for loading the "lorry car." This car has the same capacity as one oven and discharges into the oven through 4 hoppers. Each oven has 4 charging holes.

**The ovens,** 110 in number, consist of two batteries of 55 ovens each. They are 21 in. wide, tapering to 17 in. at the ram end, 9 ft. high, and 38 ft. in length. The capacity of an oven is about 12.9 tons of coal or 9.7 tons of blast furnace coke, and the time required for coking is 21 hours. The coke is discharged from the oven into steel cars by means of an electrically operated "pusher." It is then quenched in the car and is hauled by a steam locomotive to the storage bins, which are situated at the blast furnaces.

**Regenerative System of Heating Ovens.**—After the gas has been deprived of its by-products, it is fed from the distributing main into the gas-distributing channel. This channel is formed of fire brick and is situated beneath the walls of each oven. The gas passes from this channel through orifices, which are each fitted with a gas nozzle, and burns in thirteen vertical flues, built in the wall between a pair of ovens. The gas, after burning in the first thirteen vertical flues, passes into a horizontal flue, down through the remaining thirteen vertical flues in the same wall, thence through a 'checkerwork' or regenerator under the oven chamber, to the main flue, and thence to the stack. The gas and air-supply valves for heating alternate halves of the oven walls are situated at both ends of each wall. These are opened and closed simultaneously by a link. The operation consists in reversing these valves every 30 minutes, so that the gas burns alternately from each end of the oven, and the heated air for combustion is drawn from alternate regenerators. The gas from the distillation of the coal is drawn from each oven through a stand-pipe, passed to the by-product plant, where the necessary suction is furnished by three exhausters.

The Engineering Faculty of the University of Western Australia was established in 1913, and is conducting Degree Courses in Civil, Mining and Electrical and Mechanical Engineering.

\*Abstracts from "Conservation of Coal in Canada," by W. J. Dick, published by the Commission of Conservation.



## THE COAL MINE DISASTER IN SOUTH-WEST ALBERTA

By an explosion which occurred in the mine of the Hillcrest Collieries, Ltd., in the Blairmore-Frank district, southwest Alberta, on the morning of Friday, June 19, 196 lives were lost, the dead including Mr. J. Somerville Quigley, formerly of Nova Scotia, superintendent of the mine. Only 41 escaped of the 237 who entered the mine that morning. The disaster occurred at half-past nine o'clock, about two hours after the men entered the mine to commence their day's work.

Hillcrest is situated about 85 miles west of Lethbridge, Alberta. In the opposite direction, Fernie, British Columbia, is 53 miles west of Hillcrest. From both those cities, each the centre of coal mining activity, men trained in mine rescue work, with their oxygen-breathing apparatus and resuscitating appliances, together with doctors and nurses, were hastily despatched by fast trains as soon as possible after receipt of news of the occurrence. Hosmer and Michel, in British Columbia, and Taber and Macleod, in Alberta, sent helpers. The Alberta Government mine-rescue car was at Blairmore, within half a dozen miles of the scene of the disaster, so was promptly available for rescue purposes, but unfortunately all but the two-score who escaped immediately after the explosion, were past help.

The Hillcrest mines are situated on the southern extension of Turtle mountain, well known as the scene of a tremendous rockslide, which took place on April 29, 1903, causing the loss of about 70 lives, in the town of Frank, together with the destruction of much property, including nearly 7,000 ft. of the Crowsnest Railway.

### Brief Description of Hillcrest Collieries.

The following is an excerpt from "Conservation of Coal in Canada," by Mr. W. J. Dick, mining engineer to the Commission of Conservation, Ottawa:

"The mine is situated on a hill, a mile and a half from Hillcrest station, on the Crowsnest branch of the Canadian Pacific Railway. The mine tippie is on the valley level, and is connected with the railway by means of a mine spur seven-eighths of a mile in length. The coal is brought from the mine to the tippie by means of a steel rope and disc conveyor.

"The following seams have been prospected on the property:

#### Coal Seams, Hillcrest Collieries.

Thickness of intermediate strata.	Seam.	Thickness.
No. 1 to No. 2—100 ft.	No. 1	14 ft.
	No. 2	6-8 ft.
No. 2 to No. 3—300 ft.	No. 3	10-12 ft.

Remarks—No. 1, being worked; No. 2, dirty and unworkable; No. 3, dirty and unworkable.

"At present the upper seam only is being worked. The strike of the coal is about northeast and the dip 28 deg. to the west. The seams are badly broken by faults, and the coal is cut off by a fault at the face of the main entry, 4,000 ft. from the entrance.

"**Method of Mining.**—The entrance to the mine is by tunnel, driven on the outcrop, but, as the coal has been mined to the surface above the main entry, the company has driven a cross-cut tunnel and the coal is now being mined to the dip. The system of mining is pillar and stall. Chutes are driven up the pitch to the surface. The chutes are 14 ft. wide and vary in length

from 400 to 800 ft. The room pillars are 50 ft. wide and crosseuts are driven in steps on each side of the chute every 50 ft. An extraction of 85 per cent. is obtained. The pillars are removed by slicing on each side of the chute. The roof is sandstone with a 6-in. cap rock.

"Gas has been found in the mine, and Wolf safety lamps are used. Electric light, 250 volts, is used in the main road for a distance of 2,000 ft. from the entrance.

"**Blasting Methods.**—The blasting is done under the supervision of shot-firers. Monobel powder, No. 6 detonators and fuse are used for blasting down the coal. The dynamite used in rockwork is 40 and 60 per cent. The stamping material used for stemming the holes is clay, which has been sent into the mine. The mine is not subject to 'windy' shots, nor has it experienced any explosions.

"The haulage system on the main entry is by horse, while 12 x 15 in. locomotives haul the coal from the entrance to the tippie.

"In timbering, 3 lin. ft. of props is used per ton of coal mined. The mine has a capacity of 2,000 tons a day, but the actual average is about 800 tons. There are 250 men employed underground and 70 above ground.

"The coal is picked on the tippie conveyor and 90 per cent. of the output is shipped as run-of-mine.

"The following machinery has been installed near the entrance of the new rock crosseut:

"Six 150 h.p. r.t. boilers.

"One 3-stage, high-pressure air compressor for locomotive haulage.

"One 105-kw. generator, for lighting and power purposes.

One 250 h.p. hoist for hoisting out of the new 1,800 ft. slope."

## A GOOD DIVIDEND RECORD

By reports made to it Mining & Engineering World is able to show that American mines and works during the 6 months of 1914 just ended had one of the most profitable half years in the history of the industry. This, too, despite the fact that the Lake Superior copper companies either largely reduced their disbursements or discontinued them for the time being. Had these companies contributed on the same basis as before the labor troubles in their region, the half-year disbursements would have exceeded those of any similar period by several millions of dollars.

As it was, however, 111 companies divided among shareholders no less than \$59,011,077. That these companies have been remarkably successful in the years of their operation is evidenced by their total disbursements, which amount to \$860,894,204 on their combined issued capital of \$751,531,440. This is a return of approximately \$109,000,000 in excess of outstanding capitalization, a record which any industry should be proud of.

Then, when it is understood that the above distributions are participated in only by those companies making disbursements so far in 1914, and making public statements of same, and do not include profits from hundreds of properties privately owned, and still others which make no public reports of earnings, it but adds to the attractiveness of American mining investments.

Then, too, there are the securities-holding corporations whose revenues are derived not only from their holdings in other mining companies but from proper-



ties directly owned, and which are known to add largely to their income. Take for instance Phelps, Dodge & Co., one of whose properties last year yielded profits in excess of \$5,000,000.

It is little to be wondered at that the copper properties are looked upon as a "good thing" by investors, when 24 of these paid dividends during 1914 of \$23,220,406 and since incorporation have paid \$418,394,073 on an issued capitalization of \$240,051,915. In the lead for the year, naturally, is Anaconda, which has made two declarations of \$3,249,573 each, making a total for the year of \$6,498,746. Since incorporation it has to its credit \$88,506,863. Utah Copper ranks second for the year with \$2,373,254 and has made total disbursements of \$23,363,184. Calumet & Arizona is third with \$1,537,968 and since incorporation, \$20,828,617.

The gold-silver-lead-zinc producers, 80 in number, contributed to the half-year's total \$14,764,566. This is several million dollars more than was paid out during a similar period in several preceding years. To date these companies have total disbursements of \$274,582,603, approximately \$40,000,000 in excess of issued capital.

Fifty-six of the above properties are located in the United States. These contributed \$8,932,627 to the half-year's total. Since incorporation these companies have paid dividends amounting to \$198,069,741 in excess of issued capital. Goldfield Con. leads for the half year with \$1,067,744 and has a grand total of \$27,398,215. Homestake is second for the year with \$950,524 and first in total dividends with \$32,664,778 to its credit. Tonopah-Belmont is third with \$900,000 and \$6,143,000 to date.

Nineteen Canadian companies disbursed \$5,084,737 during the half year, with total dividends of \$56,099,677. Nipissing retains the lead with \$900,000 for the year and \$11,790,000 since incorporation. Coniagas is second for the half year with \$720,000 and second in total dividends with \$6,640,000. Hollinger is third for the half year with \$540,000 and to date \$2,980,000.

But five Mexican companies have reported dividend payments so far this year, these having disbursed but \$747,202.

The metallurgical works had a profitable half year as shown by reports to Mining & Engineering World. Seven of these companies contributed \$8,337,426 to the half year's total and since incorporation have divided among shareholders \$167,917,528. American Smelting & Refining leads for the year with \$2,750,000 and to date with \$75,879,719. International Nickel is second for the half year with \$2,178,954 and to date has paid out \$17,707,761. U. S. Smelting is third for the half year with \$1,162,832 and has made a total disbursement of \$20,704,601.

Amalgamated is the leader among the securities-holding corporations having divided among its shareholders this year \$4,616,636. Since incorporation this company has paid out \$86,656,417 in dividends. Phelps, Dodge & Co. are second with \$3,600,000, and have to their credit in total dividends paid \$33,971,525. American Securities ranks third with \$1,260,000 and to date has disbursed \$23,055,596.

#### CALUMET & HECLA.

The estimated copper contents of the mineral produced by the Calumet & Hecla properties for June aggregated 10,472,124 lb., compared with 9,299,507 in May, and 9,743,351 in June, 1913.

## IRON ORES OF VANCOUVER ISLAND

Victoria, B.C., July 1.

The British Columbia Government is to be requested to appoint an expert to investigate and report upon the iron resources of Vancouver Island and the establishment of an iron and steel industry on the island. This was the gist of a resolution passed at a public meeting held yesterday afternoon in the Council Chamber at the City Hall. The meeting, attended by representatives of the various public bodies of the city and a large number of citizens in their private capacity, was unanimous in its opinion that the time has arrived when energetic steps towards developing the known immense resources should be taken.

The chief feature of the gathering was the address given by Mr. William Blakemore, setting forth what had been done to date to develop the ore bodies, the success attained and the future possibilities of the industry.

Mayor Stewart presided. Short addresses were also made by Col. the Hon. E. G. Prior, Industrial and Publicity Commissioner Cuthbert and Mr. C. H. Lugrin.

Mr. Blakemore, in the course of his address, frequently cited reports made by the leading experts of this and the Old Country to show the superior quality of the iron ore found on this and adjoining islands, but he confined his attention chiefly to the work of development done on Texada island, one of the few deposits which have, to date, been proven. After outlining the comparatively small amount of work which had been done prior to fifteen years ago, he pointed to the factors which since that time have awakened new interest in the island deposits. The discovery of deposits with a much less percentage of sulphur, the introduction of the open-hearth method of treatment, the great increase in population in the Pacific Coast section and the increased market have brought to hand the time when the manufacture of steel on Vancouver Island is a practical and profitable proposition. Immense sums have been spent by the Provincial and Federal Governments on development plans, especially for transportation purposes, and within the next ten years there would be, he believed, \$100,000,000 spent in opening up the country, developing harbor facilities and generally making this section a centre of a world trade.

Mr. Blakemore treated of his subject under the following heads: Has there been found adjacent to this island a sufficient quantity of raw materials to warrant the establishment here of steel manufacturing industries; have actual trade returns shown there is a sufficient demand for the product; can pig iron be produced at a price to show a reasonable margin of profit; what would be the general result of the establishment of such a plant on Vancouver island?

As to the supply of raw materials, Mr. Blakemore stated that the supply in hitherto developed fields was diminishing. Up to date, Canada's production had not exceeded 5,000,000 tons of pig iron, and since 1896 some 6,000,000 tons had been imported for Canadian smelters. While large areas of ore were known to exist in Canada, the low grade thereof and the cost of production had hindered development. Several deposits were known to exist in British Columbia, notably on the Skeena, at Campbell river, at San Juan and on Texada island. With one exception, that on Texada island, the British Columbia deposits had not yet been sufficiently proved to show their commercial importance. Figures were quoted to show the high percentage of the metallic iron and the low percentage of sulphur and phosphates of the ore in the Campbell river



deposits, the former being greater than the average in that of the United States fields. At Texada Island, from where about 20,000 tons of ore have been shipped, excellent results were secured. Experts estimate that from 20,000,000 to 60,000,000 tons of ore is available there. Of the quantity shipped, less than 5 per cent. had to be roasted, indicating the small percentage of sulphur. It has been estimated by experts who examined the Texada island deposits that the ore can be produced for less than 50c. per ton. About 100,000 tons of crude ore will produce 100 tons of pig iron a day for sixty years, indicating that at Texada island there are ample deposits to justify development.

Mr. Blakemore quoted the report of Mr. Horace Winchell, of the United States Government staff, who has stated that the Texada island ores are strictly high grade and compare most favorably with those of the best of other deposits. Another expert has stated that the deposits "are of remarkably pure ore."

Mr. Blakemore went extensively into the question of fuel, pointing to experts' reports to the effect that there is ample coal of sufficient coking qualities and most favorably located as to the iron deposits and the vast deposits of limestone available for flux referred to by Professor William Galloway, the most eminent expert in this line, as "very pure."

Mr. Blakemore believed these reports show that there is available all the required natural resources of a high grade. As regards a market for the product, he pointed to the fact that the local market extends along the entire Pacific Coast and as far east as Winnipeg and within that territory Vancouver island iron should be able to compete with products from other countries, as freight rates would favor the local output. As for the general market outside the above area, the great development on this coast will mean a corresponding development in ocean trade and better rates, while there would be the Oriental market. He believed the home market would consume twice as much as the lowest commercial unit could turn out. At present the cheapest rate on pig iron from the nearest competitor, the Ashland plant in Wisconsin, is \$25 per ton. The British Columbia product would be of a much higher quality and closely resemble the Swedish product, which is selling on this coast at \$39 per ton. Texada island ore has been manufactured into pig iron at an actual cost of \$15.50 per ton, and Professor Galloway has stated that it can be produced at \$2.50 per ton less than in England. Professor Galloway had estimated that the cost of installing a plant at Texada island with a capacity of 100 tons of pig iron would be as follows: Blast furnace, £115,000; converting plant, £60,000; rolling mill £95,000; and contingencies, £30,000, a total of £300,000, or approximately \$1,500,000.

On the general benefits to be derived from the establishment of steel producing plants on Vancouver island, Mr. Blakemore pointed to the great development in Cape Breton Island following the establishment of the Dominion Iron & Steel Corporation. The experts had united on reporting that from the standpoint of supply of materials, easy means of transportation, ideal climate permitting all-the-year work, and proximity of ore bodies to fuel and transportation, the deposits of Vancouver island and the adjacent islands are unexcelled. Professor Galloway could see nothing in either the improvement of the electrically operated furnace or those using charcoal to interfere with the successful and profitable development of the

areas in British Columbia, with the contiguous and ample raw materials available for fuel and flux.

In closing, Mr. Blakemore suggested that an appeal be made to the Provincial Government for the appointment of an expert to make a thorough report upon the whole question as it affects the Province.

Mr. C. H. Lugin, in moving a vote of thanks to Mr. Blakemore, stated that the data furnished by the latter has established beyond doubt the existence of abundant deposits on Vancouver island and adjacent islands. One of the very finest deposits is on the route of the suggested Seymour Narrows connection. Mr. Lugin cited the experience of the Irondale plant, which was forced into liquidation by the United States Steel Co., which now controls the deposits, and suggested it would be wise for those seeking to develop the island deposits not to lose sight of the power of the trust. Oriental competition must be expected. He had personally seen a contract between the Irondale concern and Chinese firms for the delivery of pig iron from the latter country. If the idea is to establish a plant here to sell to the Oriental market, the local concern will find itself on very difficult ground. It would be unwise to represent that an Oriental market is expected for the local output of pig iron. The great factor will be the future development of this Coast, a development expected by such large concerns as Yarrow, Limited, which has located here, not for immediate results, but to be in a position to take a share of the great business which will be available as development here increases.

Col. the Hon. E. G. Prior seconded the vote of thanks to Mr. Blakemore, and approved of the appeal to the Government for a thorough and expert investigation and report. He urged that the greatest care must be taken to see that the information given out to the world is, in every respect, correct.

Alderman Cuthbert spoke briefly, urging that the Provincial Government might very properly consider the question of assisting the iron industry.—Daily Colonist.

#### SUMMARY REPORT OF THE GEOLOGICAL SURVEY FOR 1912.

The Geological Survey has issued a report on the work done during 1912. This includes the reports of the various officials, as follows:

Geology of a portion of the Yukon-Alaska boundary, between Porcupine and Yukon rivers: D. D. Cairnes; a geological reconnaissance on Graham island, Queen Charlotte group, B.C.: Charles H. Clapp; geology of portions of the Sooke and Duncan map-areas, Vancouver island, British Columbia: Charles H. Clapp; geological section along the Grand Trunk Pacific railway, from Prince Rupert to Aldermere, B.C.: R. G. McConnell; Princess Royal island, B. C.: R. G. McConnell; Texada island, B.C.: R. G. McConnell; Groundhog coal field, B.C.; G. S. Malloch; Metalliferous deposits in the vicinity of Hazelton, B.C.: G. S. Malloch; a geological reconnaissance of the Fraser River valley from Lytton to Vancouver, British Columbia: Norman L. Bowen; geology of the Thompson River valley below Kamloops lake, B.C.: Chas. W. Drysdale; Savona map-area, British Columbia: Bruce Rose; geology of the Selkirk and Purcell mountains at the Canadian Pacific railway (main line): Reginald A. Daly; Rocky mountain section between Banff, Alta., and Golden, B.C., along the Canadian Pacific railway: John A. Allan; exploration between Lillooet and Chilko lake, British



Columbia: A. M. Bateman; Lillooet map-area, British Columbia: A. M. Bateman; the geology of certain portions of Yale district, B.C.: Charles Camsell; reconnaissance in East Kootenay, British Columbia: Stuart J. Schofield; Clay investigations in western Canada: Heinrich Ries; Blairmore map-area, Alberta; South Fork coal area, Oldman river, Alberta: John D. Mackenzie; the Silurian and Devonian section of western Manitoba: E. M. Kindle; region east of the south end of Lake Winnipeg: Elwood S. Moore; notes concerning the features of St. Joseph island, Lake Huron, Ontario: Frank Leverett; the Silurian of Manitoulin island and western Ontario: M. Y. Williams; Thedford and vicinity, Ontario: M. Y. Williams; notes on the Oriskany sandstone and the Ohio shale of the Ontario peninsula: E. M. Kindle; Stratigraphy of southwestern Ontario: Clinton R. Stauffer; geology of Lake Simcoe area, Ontario: Beaverton, Sutton, and Barrie sheets: W. A. Johnston; geology of Onaping sheet, Ontario: W. H. Collins; a geological reconnaissance from Lake Kipawa via Grand Lake Victoria, to Kanikawinika island, Bell river, Quebec: M. E. Wilson; exploration of the headwaters of the Broadback or Little Nottaway river, northwestern Quebec: H. C. Cooke; the Trenton group in Ontario and Quebec: P. E. Raymond; investigation of clay resources of Quebec: Joseph Keele; marine shore-lines in southeastern Quebec: J. W. Goldthwait; Joggins Carboniferous section, Nova Scotia: W. A. Bell; Greenfield and Liverpool town map-areas, Nova Scotia: E. R. Faribault; Oldham Gold District, Nova Scotia: E. R. Faribault; clays in Lunenburg county, Nova Scotia: E. R. Faribault; geology of the neighborhood of New Ross, Lunenburg county, Nova Scotia: W. J. Wright; the stratigraphic relations of the Riversdale-Union and Windsor formations of Nova Scotia: Jesse E. Hyde; report of the vertebrate palaeontologist: Lawrence M. Lambe; report of the invertebrate palaeontologist: E. M. Kindle; palaeobotany: W. J. Wilson; mineralogy: Robt. A. A. Johnston; Bore-hole records (water, oil, etc.): E. D. Ingall; Lillooet map-area, British Columbia: W. E. Lawson; Windermere map-area, British Columbia: K. G. Chipman; St. John sheet, New Brunswick: A. C. T. Sheppard; Triangulation work: S. C. McLean; Blairmore map-area, Alberta: B. R. Mackay; Texada Island map-area, British Columbia: D. A. Nichols; spirit levelling, St. John sheet, New Brunswick; flathead triangulation, British Columbia and Alberta: S. C. McLean.

There are also reports by the biological, anthropological and draughting divisions.

The report is illustrated by several colored geological and topographical maps, and comprises a volume of 544 pages. It can be obtained on application to the Director of the Geological Survey, Ottawa.

### A NEW STADIA CIRCLE.

The subsequent computations necessary to reduce observed stadia distances to the correct horizontal and vertical distances have long been a source of trouble and labor to the surveyor. Many arrangements such as charts, tables and slide rules have been devised to minimize this work, but all have been somewhat complicated and have presented a fruitful source of error. For this reason stadia measurements have not found the universal application which their accuracy and convenience would presuppose.

In the new K. and E. Stadia Circle an arrangement is presented which will undoubtedly stimulate the use

of stadia measurements in all branches of surveying. Not only does this arrangement facilitate the taking of field notes but it reduces the calculations of these notes to the simplest arithmetical processes, and, furthermore, the arrangement does not encumber the instrument with complicated and delicate equipment.

The usual method of taking stadia measurements is to observe the interval intercepted on a rod by the stadia hairs and the angle of depression or elevation of the telescope. With this data the observer is then enabled, by using the formulas

$$H = \frac{S \cos^2 a}{2} \text{ and } V = \frac{S \sin 2a}{2},$$

to compute the correct

horizontal distance and elevation of the point in question. The mechanical means devised for the solution of these formulae have greatly simplified the plotting of notes, but their use still involves considerable labor and necessitates the carrying of extra equipment into the field.

The K. & E. Stadia Circle is a modification of the regular transit circle whereby the degree graduations on two opposite segments are replaced by special graduations which give directly the per cent. of the observed stadia distance represented by the horizontal and vertical components.

Through an arc of approximately 60° at the right and left hand sides of the circle the degree graduations are replaced by the special stadia graduations. At the index marked Hor. is read the percentage factor to be applied to the observed stadia distance to obtain the correct horizontal distance. At the index marked Vert., is read the percentage factor to be applied to the observed stadia distance to obtain the difference in elevation between the rod and instrument. Complication in the calculations is avoided by bringing the centre cross hair of the telescope to a target or mark on the rod which has been placed at instrument height before reading H and V.

Example: Suppose the observed stadia distance to be 480 ft. and the telescope, when sighted on the target, to be inclined at such an angle that the reading at the Hor. index is .97 and at the Vert. index .17. Then the correct horizontal distance would be  $480 \times .97 = 465.6$  ft. and the difference in elevation would be  $480 \times .17 = 81.6$  ft.

The very simplicity of this arrangement would seem to raise doubts as to its accuracy but the position of each special graduation is theoretically correct and exhaustive tests of the instrument throughout the full range of the stadia graduations have proven the device to be practically free from error.

Over a long series of tests by different observers the average error in the reading of the Horizontal correction factor was found to be 0.05 which in a 500 ft. sight would introduce an error of 0.25 ft. in the computed horizontal distance. The same trials applied in the reading of the Vertical correction factor disclosed an average error of 0.02, which in a 500 ft. sight would introduce an error of 0.10 ft.

By the method of least squares the average error in reading was computed to be

$$\begin{aligned} \text{Horizontal} & \pm 0.09 \\ \text{Vertical} & \pm 0.07 \end{aligned}$$

These larger errors, in a 500 ft. sight would effect the computation of the Horizontal and Vertical distances by  $\pm 0.45$  and  $\pm 0.35$  ft. respectively, and as the allowable error in stadia work is 1 per cent., it will be readily seen that, in accuracy, the K. & E. Stadia



Circle compares favorably with any method of computation now used.

The greatest advantage of the device, however, lies in the rapidity with which field notes and the subsequent calculations can be made and it is this saving that will do more than anything else to popularize the new device among engineers who are engaged in topographical work.

### NINETY POUND DRILLING MACHINE IN MICHIGAN.

One of the favorite fictions of the labor difficulties in the copper country of Michigan was the discussion of the one man drilling machine. In the Western Federation parades they carried banners upon which were painted pictures of this machine with an insignia designating that the drill was the agitator. It was included in the list of complaints which the federation men presented to the managers of the mines. Yet it never was seriously considered, even by the Federation agitators, for the one-man drilling machine was in use in the western camps, dominated by the Federation crowd, long before it was introduced into the Michigan copper mines. And, as a matter of fact there is no objection to it on the part of most of the men.

The one man drill weighs under 150 lbs. The two man machine weighs 290 lbs. The miner operating the one man machine has been able to increase his wages between 20 and 30 per cent. The younger men all clamor for the one man machine. In the Calumet and Hecla mines both kinds are used and will continue to be used for some time to come.

When the old machine, the two man drill, was first introduced there was objection to it. Some men explained that it would throw a lot of miners out of work. Up to that time all drilling was done by machine, one striker or two strikers and one man steering the drill as the parties might be made up. It was all hard hand work, slower than the machines and less satisfactory. When the drilling by machinery commenced it was feared that the result would be to have a lot of idle men on hand. Instead of that and like every other machinery improvement in the history of the country the introduction of the drill gave more miners more work as it resulted in an expansion of general operations on a larger scale than was considered possible at the time. The machine drill worked faster and made more holes than any hand drill ever operated. Now comes the one man machine that takes the place of the old drill that has been operating practically unchanged from the time it was first introduced. The new drill is lighter and works faster.

But another improvement is to be introduced soon. There can be no possible objection to it. A new type of one man machine is now being tried in the Calumet and Hecla and some of the other mines. It is a butterfly drill that weighs 90 lb., 40 lb. lighter than the one man drill now in use. It is claimed that the drill does the work of the heavier one-man machine and does it just as satisfactorily. Extensive experiments will be conducted before it is put into general use in the mines. There are liable to be some defects in the machine which will have to be overcome, following the tests and it may be months before its use becomes at all general. But a 90 lb. machine can be run by a small boy and will require no more attention to operate than an automobile wheel requires when the car is running. Then again, changing positions, taking the machine down and setting it up again, now the most

difficult part of the task of running the one man drill, will become a good deal easier with this machine. One mining man told me that he thought the 90 lb. machine particularly applicable to all of the easier amygdaloid mines of this district and is satisfied that within a few years it will be in general use. It will not only make the work easier for the miner, but will make his pay higher. And the company will get a larger tonnage than ever per man.—Homer A. Guck in Mining Gazette.

### GOLD OUTPUT OF SOUTH AFRICA.

Editor Mabson of the London Statist has issued his annual compilation for 1914-15 of about 700 pages giving detailed information concerning the mines of Africa with maps and plans.

In his interesting introduction to this, his tenth edition, Mr. Mabson discusses the question of the lives of the producing mines and the outlook as to ability to reduce costs.

Before the Dominion's Royal Commission this year estimates were put forward of producing mines containing still 580,000,000 tons of payable ore and of untouched further area containing a like amount. In other words, after 280,000,000 tons have been mined since the beginning of production on the Rand, there still remains four times as much tonnage as a basis for future production.

The Rand production in 1913 was £35,800,000, or 37¾ per cent. of the world's gold production. The gold mines paid in 1913 £8,000,000 wages to white persons and to natives £5,300,000. The industry annually consumes something like £10,600,000, value of stores and materials.

The policy of the Union Governments in smoothing matters with the white labor party on the Rand by replacing competent colored men with whites has kept costs at a high level. Signs, however, are not wanting that the artificial color bar will soon be swept away and a reduction in working costs per ton will follow.

One shilling per ton on the recent rate of 28,000,000 tons per annum output represents £1,400,000. The total profit of the Rand for 1913 was about £12,000,000 subject to profits taxes.

The total African gold production last year was £41,538,000 in a total world production of £94,720,000. The output of the United States was £18,206,000.—Boston News Bureau.

### CONGRESS OF APPLIED CHEMISTRY.

The executive Committee of the Ninth International Congress of Applied Chemistry, to be held in St. Petersburg, Russia, in 1915, has just issued its first Preliminary Announcement.

The Congress will open on July 26-August 8, and close on August 1-14, the second dates in each case being the dates in the new-style calendar. That is, according to the calendar in use in the United States the Congress will be held from August 8 to 14, 1915.

The Emperor of Russia will be the Patron of the Congress. D. P. Konvaloff, Assistant Minister of Trade and Commerce, will be the Honorary President. Professor P. I. Walden will be the President. Major-General Professor W. N. Ipatiew will be the Honorary Secretary.

All letters are to be addressed to the Honorary Secretary, Ninth International Congress of Applied Chemistry, Winter Palace Place 8, St. Petersburg, Russia (cable address Chimicongress, St. Petersburg).



## PERSONAL AND GENERAL

Dr. C. P. Berkey, professor of petrography at Columbia University, is at the Porcupine Crown mine, Timmins, Ont.

Mr. R. E. Hore has returned to Toronto after visiting mines at Porcupine and Cobalt.

Mr. D. G. Small, lately in Mexico, is now at the Hollinger mine, Timmins, Ont.

Prof. C. H. E. Wright has returned to Toronto after spending a month in Western Canada.

Prof. E. S. Bruce has resigned as head of the Department of Metallurgy at the Michigan College of Mines and will return to practical metallurgical work.

The sixth semi-annual meeting of the American Institute of Chemical Engineers was held in Troy, N. Y., June 17 to June 20.

Mr. Thos. R. Loudon has been appointed assistant professor of ferro-metallurgy at the University of Toronto.

Mr. J. B. Tyrrell has returned to Toronto after visiting mines in British Columbia.

Mr. H. G. Young, manager of the Trethewey Silver-Cobalt Mine, Ltd., has resigned to take up the position as consulting Engineer to the Algonquin Development Co., Ltd., and general manager to its subsidiary companies. Mr. Young will leave Cobalt about August 1st.

Mr. Ed. E. Campbell, of the Granby Consolidated Co.'s mining engineering staff, is now at Valdes, Alaska, in charge of the company's mining operations there, and of its business generally—mining and obtaining custom ore for its smelter at Anyox, Observatory inlet, B.C., in the Alaskan district around Valdes.

Mr. Geo. H. Dickson, for some time past with Mr. A. G. Larson, of Vancouver, B.C., now makes Calgary, Alberta, his headquarters, chiefly in connection with examinations of lands taken up for oil prospecting purposes.

Mr. W. J. Eaton, formerly on the Granby Consolidated Co.'s laboratory staff, at its smelter near Grand Forks, B.C., is now superintendent at the Union mining property, in Franklin Camp, north fork of Kettle river, from which ore of comparatively high grade is being shipped to Grand Forks and Trail smelteries.

Mr. Newton W. Emmens, of Vancouver, B.C., has been employed by the British Columbia Department of Mines to investigate and report on gas and oil prospects in the country between Revelstoke and Arrowhead, on Columbia river, B.C.

Mr. F. S. Falconer, of the topographical branch of the Geological Survey of Canada, is in the field obtaining data for use in mapping the topograph of an area of 1,500 square miles in British Columbia, including the portion of Columbia River valley between Revelstoke and Downie creek, as well as the valley of Jordan river.

Mr. Thomas Graham, of Victoria, chief inspector of mines for the province of British Columbia, has been elected third vice-president of the American Institute of Mine Inspectors, which last month held its annual convention at Pittsburgh, Pennsylvania, U.S.A.

Prof. L. C. Harrington, of Grand Forks, North Dakota, U.S.A., has been in Southwestern Alberta and West Kootenay, B.C., going thence to Western Washington, and afterward to the Coeur d'Alene district of Idaho. A visit to Butte and Anaconda, Montana, was also included in the itinerary of the mining engineering students who travelled with Professor Harrington.

Mr. Frederic Keffer, of Greenwood, B.C., recently

paid a visit to the Vancouver Portland Cement Co.'s works at Tod inlet, Vancouver island.

Mr. Lewis A. Levensaler, of Tacoma, Washington, representing the Tacoma Smelting Co., with reduction works on Puget Sound, has been on Moresby island of the Queen Charlotte group, and at Anyox, Observatory inlet also on the British Columbia coast. He afterward went to Ketchikan, Southeastern Alaska.

Mr. R. H. Ley, formerly practising assaying at Nelson, B.C., is now resident agent for Northern British Columbia for the Giant Powder Co. Consolidated. He has his headquarters at Prince Rupert.

Mr. Paul Lincoln, who several months ago arrived in British Columbia from Chihuahua, Mexico, is now manager for the Noble Five Consolidated Mines Co., owning and operating the Noble Five group of mines near Cody, Sloean district, B.C.

Mr. A. W. McCune, of Salt Lake City, Utah, for many years owning mining property in Ainsworth and Sloean mining divisions, British Columbia, has been visiting those districts with a view to resuming work on several of the properties, which have been idle for a number of years.

Mr. J. D. MacKenzie, of the Geological Survey of Canada, Ottawa, has gone to Graham island of the Queen Charlotte group, to complete the geological investigations of the coal deposits there.

Mr. F. S. Norcross, for some time past superintendent of the British Columbia Copper Co.'s Mother Lode mine, and the New Dominion Copper Co.'s Rawhide mine, both in Boundary district of British Columbia, has been appointed general superintendent of the former company's various mines. He has removed from Greenwood to Copper mountain, near Princeton, Similkameen, where the company is developing, under option of purchase, a large group of mineral claims. He has been succeeded at the Mother Lode and Rawhide mines by Mr. P. E. Crane, formerly with the Granby Consolidated Co. at its big copper mines in Phoenix camp.

Mr. J. L. Parker, a mining engineer well known in the Pacific Northwest, is convalescent after a serious illness with pneumonia brought on by exposure when examining mining property at a high altitude in the St. Mary's River district, East Kootenay. After several weeks spent in the St. Eugene Hospital, near Cranbrook, B.C., he has returned to his home in Southwest Alberta.

Mr. R. W. Randall, of San Francisco, California, is superintending hydraulic placer-mining operations on French creek, Big Bend district, north of Revelstoke, B. C.

Prof. Milnor Roberts, dean of the College of Mines, University of Washington, Seattle, Washington, U.S.A., has gone to Graham island of the Queen Charlotte group, to direct operations in connection with boring for coal there.

Mr. Alex. Smith, for nearly 20 years in charge of the development of the Surprise mine, in Sloean district, British Columbia, has returned to New Denver, Sloean lake, after having spent the winter in Ontario.

Mr. N. W. Sweetser, for some time chief assistant to Mr. Chas. M. Campbell, superintendent of the Granby Consolidated Co.'s copper mines at Phoenix, B.C., has been appointed to charge of the company's Mamie mine and other interests on Prince of Wales island,



Southeast Alaska. The Mamie was formerly the property of the Brown-Alaska Co. which several years ago went into liquidation.

Mr. C. E. Boekus, Vice President of the Clinchfield Coal Corporation, Dante, Va., has just placed a contract with the Roberts and Schaefer Company for approximately \$50,000 for the designing and installation of a Marcus patent, five-track steel coal tippie with a 600 ft. long inclined car haul, all to be electrically operated, at their mine at Hurricane, Virginia.

The annual meeting of the Lake Superior Mining Institute will be held August 31 to September 3. The first day will be spent at Ishpeming. On September 1 business sessions will be held on the boat en route to Detroit. The last two days will be spent in Detroit.

The Jeffrey Manufacturing Co. has issued a bulletin describing 'Arewall' coal cutters for the 'overcutting' system of mining.

The Herbert Morris Crane & Hoist Co. has issued a bulletin devoted exclusively to the Morris type SI hand operated overhead traveling crane.

Mr. H. J. Stewart, assistant manager of Crown Reserve Mining Company, Limited, Cobalt, is on a two months trip of inspection to the principal mining camps in the West.

Canadian Allis-Chalmers has issued a bulletin on heavy duty Corliss engines.

## OBITUARY

Mr. George Turner, who died at Savona, B.C., on June 17, was born at Oswego, New York, 64 years ago. For nearly 30 years he had been associated with various enterprises in British Columbia, to which province he went in the eighties of the last century. He was resident in Vancouver prior to the destruction of that city by fire in 1886. Ten years later he was engaged in mining in West Kootenay district, in Rossland and Slocan camps, respectively; and, again, a few years ago, when he was manager of a mine near Nelson. Since then he had spent much time on his ranch in San Joaquin valley, California, but each summer he returned to British Columbia. His body was taken to Los Angeles, California, for interment there.

# SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

Three metalliferous mining companies operating in British Columbia recently declared their second quarterly dividends. The Consolidated Mining and Smelting Company of Canada, Ltd., on July 1 paid to shareholders of record on June 15, a dividend No. 12, of \$2 a share, which is at the rate of eight per cent. per annum; total amount of this distribution of profits, \$116,088. The Granby Consolidated M. S. and P. Co., Ltd., on June 15 paid to shareholders of record on May 29, a dividend of \$1.50 a share; total amount of this distribution, \$224,977.73. The Hedley Gold Mining Co. on June 30 paid to shareholders of record on June 19, a quarterly dividend of three per cent. and an additional dividend of two per cent., together 50 cents a share; amount of this distribution, \$60,000. In addition, the Standard Silver-Lead Mining Co. has continued to pay 21-2 cents a share monthly on its 2,000,000 shares, or \$50,000 a month as a regular dividend, with an occasional extra dividend of a similar amount. The total amount of dividends paid by British Columbia metalliferous mining companies for the first half of 1914 is approximately \$1,200,000.

**Consolidated M. and S. Co.**—While little information has been given out by the Consolidated Mining and Smelting Co. concerning recent developments in its mines in Rossland camp, there is no doubt that these have been important and of such a nature as to assure a long-continued output of ore of good grade, so that the company's operations here may with confidence be regarded as certain to prove profitable, and that to a degree gratifying alike to management and shareholders. This applies to the Le Roi group as well as to the Centre Star-War Eagle mines, all of which are the property of the Consolidated Co.

**Le Roi No. 2, Ltd.**—In the Le Roi No. 2 Co.'s Josie group, which adjoins the Le Roi group on the west, developments are also satisfactory, especially on the level corresponding to the 1650-ft. level of the Le Roi mine. Some time ago it was made known that the Le Roi No. 2 company had opened at that depth, in the Annie claim which adjoins the Black Bear of the Le

Roi group, a shoot of ore which across an average width of 6 ft. gave assay returns of gold 0.25 oz. to the ton and copper 3.3 per cent., also that in the hanging wall of the same drift there had been followed for a distance of 65 ft. two veinlets containing pyrrhotite, in places 24 in. in width, average samples of which assayed 15 dw. in gold to the ton and 0.8 per cent. copper. Since then a winze sunk from the 1650-ft. level to a depth of 85 ft. has been in ore all the way, with neither wall showing. This ore came in from the Black Bear ground, so that there is good reason to believe it also occurs in considerable quantity in the Consolidated Co.'s property. The Le Roi No. 2 Co. has also met with encouragement in its northern territory, a part of its property not yet extensively developed.

**Smeltery at Trail.**—Steady and substantial progress has also been made at the Consolidated Co.'s smelting works and electrolytic refinery at Trail. In the copper department, another large blast furnace is being built, this to take the place of the old No. 4 which was of much smaller dimensions and smelting capacity; it is of similar size and style to that of the new furnace put in last year to replace the old No. 2, namely of dimensions 42 in. by 35 ft. at the tuyere level and having 28 standard tuyeres on each side. These larger furnaces have arched tops and flat flues instead of having the old-style goose-neck flue over the furnace, the object of doing away with the goose-neck being to leave clear space for an overhead travelling electric crane for handling purposes on both feeding and tapping floors. Both blowing and crushing capacity have been increased to meet the requirements of the larger furnaces, another of which is to be put in later. In the lead department, additions have also been made; two of the three new lead stacks are in operation, these having dimensions of 45 by 216 in. at the tuyeres. Re-arrangement of the Huntington-Heberlein roasting and converting plant has been completed and two Wedge roasters are also in operation. Conveyors now take the "roast" from the roasters to a central bin, and the converters are taken to be filled or dumped by an electric crane. More tanks have been added in the electrolytic refining department. The F. G. Cottrell



system of fume condensation is being tried, and another stack is being built—of reinforced concrete and 250 ft. in height—to dispose of smoke from the works.

### Boundary.

**British Columbia Copper Co.**—The larger part of the ore being smelted at the company's works at Greenwood is coming from the Mother Lode mine, three or four miles from Greenwood, in Deadwood camp. Following prospecting with a diamond drill, ore of higher grade than that left in the old workings of the mine, has been opened, and this ore is being extracted and smelted. The New Dominion Copper Co.'s Rawhide mine, in Phoenix camp, continues to ship ore to the smelter at Greenwood, but in smaller quantity than during last year.

**Granby Con. M. S. and P. Co.**—Shipment of ore from the Snowshoe mine, purchased by this company late last year, has been commenced. The mine is being worked from the Curlew level of the Granby mines, this claim of the Granby group being in close proximity to the Snowshoe. An electrically-operated Bucyrus shovel of the 40R type has been put in at the No. 2 level, which takes in the old "glory-hole" in which steam shovels were worked years ago. The new power shovel has a one-and-a-half-yard dipper. The company has resumed diamond-drilling on the Lame Foot group, situated about 15 miles south of Grand Forks, in the State of Washington.

**Camp McKirney.**—There is a prospect of a revival of mining in this old camp, which has been practically deserted for seven or eight years, for the tailing dump of the old Cariboo-McKinney gold mine is being sampled with a view to the material being retreated. Some of the mineral claims constituting the Cariboo-McKinney group were staked in 1887, and after sufficient development work had been done a stamp-mill was put in. The aggregate value of gold recovered up to the time operations were suspended on this property in 1903 has been estimated at \$1,500,000, and dividends were paid to a total amount of \$546,837. Other properties in the camp were worked during several later years, but they did not prove similarly profitable. The Waterloo and Sailor were each equipped with a 10-stamp mill but neither has been worked of late years. In another part of the camp, about two miles from the worked gold belt, copper ore is known to occur; from one of the claims in that neighborhood ore is now hauled to the railway for shipment to a smelter, the intention being to have a bulk test made of two carloads of this ore.

**Quatsino M. and D. Co.**—A recently published report gives information concerning a number of mineral claims situated near Elk lake, about 16 miles from the southeast arm of Quatsino sound, Vancouver island. On one group of these, known as the Old Sport group, work has been done by United States men represented by Mr. M. W. Bacon, of Butte, Montana, manager of the Stewart Mining Co., operating in the Coeur d'Alene district, Idaho, who visited the property late last autumn and shortly afterward arranged for men to do exploratory work throughout the winter. Supplies for the winter's operations, and a diamond drill, were sent in. Now it is stated that drilling has shown the vein to be about 35 ft. in width at a depth of 338 ft., and that there is about 18 ft. in thickness of commercial ore. This report, however, comes from one of the original owners of the property, not from the prospective purchasers. The ore is described as chalcopryite in a magnetite gangue. It is stated, further,

that a compressor, a waterwheel for driving same, and two machine drills have been landed at Quatsino sound and are awaiting provision being made for transporting this plant to the Old Sport group, for which something like eight miles of temporary tramway will have to be constructed, the remaining part of the distance being over three lakes. The syndicate Mr. Bacon represents is called the Quatsino Mining and Development Co.

A second syndicate is developing the Merry Widow group in the same neighborhood, and this is represented by Mr. Conrad Wolfle, of Spokane, Washington, president and general manager of the United Cop-



In the Canadian Rockies

per Mining Co., operating at Chewelah, Washington. The account given of the lode on this property is that it has been exposed near the surface along a distance of about 600 ft.; that it is a large vein of pyrrhotite, and that assay returns give a value in gold from \$4 upward to the ton and 1.5 per cent. in copper. Preparations are being made to do some diamond-drilling on this property.

There is a good waterpower within a mile of the Old Sport group. There are three routes suitable for transportation facilities; one to the June landing, on southeast arm of Quatsino sound, another to Rupert arm of the sound (which has its outlet on the west coast of the island), and the third to Port McNeill or Hardy bay on the east coast. The distance to the last-



mentioned shipping port is greatest, but construction between it and the mining camps would be less heavy. The transportation problem is now having the attention of those chiefly interested in the syndicates, beside whom there are numbers of individual claim owners also concerned.

**Coal Strike Still On.**—A published report of a mass meeting of coal-miners on strike at Nanaimo and neighborhood gives the information that the strikers were addressed by Mr. Robert Foster, president of the local district of the United Mine Workers of America, who stated that it would not be surprising if the allowances to strikers were soon stopped, the funds of the organization having been much depleted. The U. M. W. of A. was said to be more than \$500,000 behind, owing to its having paid out \$15,000 weekly to the strikers on Vancouver island, and \$36,000 to men on strike in Colorado. The further information was given that by reason of lack of funds, it had not been practicable to give relief to men who had been two months on strike in Ohio. Notwithstanding this announcement, on a vote being taken on a proposal to call off the strike on Vancouver island, 1,467 voted for its continuance and only 274 votes were cast in favor of calling it off. Meanwhile all the coal mines in Nanai-

operated along lines advised by Mr. T. J. Vaughan-Rhys, who recently examined the mine.

The Black Diamond, a mining property situated in the neighborhood of Toby creek, East Kootenay, has been acquired by United States men who have already prospected it and found on it galena ore of good grade. More development work is to be done preparatory to getting out ore for shipment to a smelter.

Mr. A. Robinson and associates are preparing to operate the Carmi mine, on the west fork of Kettle river. The Carmi ore contains gold and silver. Ten or twelve years ago nearly 1,000 tons was sent to a Boundary smelter, but a 50-mile wagon haul was too costly to leave any profit for the shippers. Afterward a stamp-mill was put in, but neither mine nor mill has been worked during recent years. Now that a railway has been constructed past Carmi, the transportation difficulty has been overcome.

On one day about the middle of June all previous records for quantity of coal hoisted in one day at the Western Fuel Co.'s No. 1 shaft, Esplanade, Nanaimo, Vancouver island, were exceeded, the total for that day having been 1,121 tons. All this coal came from the north side of the mine, the south side having been flooded when, last year, the United Mine Workers of



A Coal Seam at Tofield, Alberta

mo district are being worked full-handed, and there are beside many names on a list of those waiting for employment to be found for them.

#### General Notes.

It has been reported that tin-bearing ore has been found in the northern part of Lardeau county, about 20 miles up Fish river from Camborne. Mr. Stuart J. Schofield is going in to investigate, for the Dominion Department of Mines, and Mr. Newton W. Emmens for the Provincial Bureau of Mines.

Some time ago it was reported that ore containing gold had been found in the Coquihalla river, Hope mountains. A district newspaper has recently published news to the effect that development of the claims on which the find was made is resulting satisfactorily and that gold-quartz is now known to occur along a distance of two miles.

Mr. Geo. A. Clothier and associates have leased the Silver Cup group in the Hazelton district, Skeena country, and are preparing to operate the property. Work on the American Boy, owned by the Harris Mines, Ltd., also situated in Hazelton district, is to be

America, after having declared a strike, refused to permit the miners to wall off that part of the mine, which was on fire so it had to be flooded.

## NOVA SCOTIA

**June Outputs—Dominion Coal Company.**—The output of the Cape Breton mines in June totalled 452,083 tons, exceeding by about 14,000 tons the greatest previous monthly production from these mines. This large quantity does not, however, represent the capacity of the mines, as owing to the decided slackness in trade which has now developed, the output was necessarily restricted by idle time at the collieries. Had it been possible to work the mines to their full capacity, and output of 490,000 tons would have been with ease obtained. The largest previous monthly production was got in October 1913, but in that month the mines worked to full capacity. A comparison between October 1913, and June 1914, is therefore of interest, and is as follows:



		June 1914.	October 1913.
		tons	tons
Colliery	1	44,350	48,180
"	2	72,885	73,611
"	3	7,505	10,867
"	4	39,182	34,825
"	5	16,373	19,406
"	6	25,127	25,680
"	7	19,313	21,327
"	8	4,716	6,482
"	9	37,782	35,468
"	10	15,930	16,471
"	11	8,180	7,165
"	12	41,251	33,523
"	14	40,700	37,440
"	15	23,139	20,649
"	16	26,547	26,343
"	17	1,620	.....
"	21	13,701	13,449
"	22	13,782	7,386
Total number tons ..		452,083	438,272

As before stated, if the mines had worked every day in June the output would have reached 490,000 tons, an advance on the largest previous production of almost 50,000 tons per month. It may also be pointed out that this production is possible on single-shift, and could therefore be greatly augmented if the mines were worked double-shift as they were some years ago.

It is probable that June is the last month in which any appreciable output will show to the credit of No. 8 colliery. This mine, which has been continuously operated by the Dominion Coal Company and its predecessors since 1863, is exhausted, and all the remaining coal will be extracted by about the middle of July. The closing of this colliery will entail very little dislocation of employment or residence among the men who have worked there, as the process has been a very gradual one and the men have found employment at the other collieries of the company. Nevertheless there is always a feeling of regret and loss at the closing of an old-established colliery. Those whose working life is spent on the surface cannot realize the attachment of the miner to the underground scenes which he has visited possibly every working day for many years. The underground streets and landmarks of a mine are as familiar to the miner as the streets and views among which overground workers pursue their daily work, for although the working face is constantly advancing and changing, the main approaches of an old colliery have a permanence that even many towns and cities do not possess in this rapidly growing country. The opening of International Colliery took place ten years before the incorporation of the City of Winnipeg, and it is probable that the pit-bottom and the main approaches of this mine changed very little between 1863 and to-day. The uninitiated may smile at the idea of the miner feeling an affection for the scenes which accompany what they are pleased to term his "daily toil in the bowels of the earth," a piece of "journallese" that is often encountered in the daily newspapers, but those who are miners will appreciate the point of view.

## PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Sesekinika.**—The discovery on the La Bine and Smith claims near Sesekinika still continues to attract attention. The quartz vein in its size and apparent richness resembles that of the Tough-Oakes as seen on the surface, very closely. It is from two to six or eight in. wide in an altered Keewatin rock. It is most persistent in its strike. It has been uncovered now for several hundred feet and it holds good at both ends. No work beyond trenching has been done on this vein yet, but in several places samples remarkable in gold and telluride ore have been taken out.

**Miracle.**—A mill is being erected on the claims of the Porcupine Miracle Mining Co. in the township of Langmuir. It is expected to have the plant running some time in the month of August, the crushing being done in Hardinge mill and the recovery made by straight amalgamation. A shaft has been sunk 105 ft. and a drift has been run for 40 ft.

**Hunton.**—Diamond drilling on the Hunton claims in Kirkland Lake are reported to be quite encouraging. The drill has now reached a depth of 250 ft. It has passed through 75 ft. of mineralized rock and the assays from the cores give good hopes for future development.

**In Grenville township,** about two and a half miles from Kenogami station, a good find is reported on the Stitt claims. Between 125 and 130 ft. of stripping has been done and the vein shows an average width of about 3 ft.

**Radium.**—Mr. Stopford Brunton, a McGill graduate, has been deputed by the Canadian Geological Survey to spend several months in Northern Ontario making examination of ore with a view of discovery if any possess radio activity. This is intended as an assistance to the search for radium in the Province, which has been quickened by the promise of a bounty of \$25,000. Mr. Brunton has with him a simple apparatus for testing minerals for radio activity, and he will be most pleased to see all prospectors and test (quite free of charge) any specimens they may bring him. He is now in Cobalt and has had quite a number of specimens submitted to him already. The close analogy of the Cobalt fields to those of Saxony lead to some little hope that radio active minerals will be found in Northern Ontario. Mr. Brunton will proceed north to Kirkland Lake and Porcupine when he has been for some time in Cobalt, and he will make examination for radio active minerals as well as making tests of all specimens brought to him.

## COBALT, GOWGANDA AND ELK LAKE

**Nipissing** has cut its vein 64 at a level of 900 ft. in a crosscut. The vein itself is a foot wide of calcite, but values are not such as to give great encouragement of further exploration in the Keewatin under the conglomerate in this portion of the camp. Nothing has so far been found in the Keewatin under the conglomerate, and the work was undertaken purely from an exploration standpoint, the management not having any great belief that results would pay for development. The drift on the vein will be continued in the hope of picking up an ore shoot. This is, by at least 100 ft., the deepest working in the camp.



**Cochrane.**—A small shoot of ore has been opened up on the Cochrane Cobalt mine at the 100 ft. level. The vein is from 3 to 5 in. wide, of remarkably high grade ore. A raise has been put up on it for 10 ft. and here it holds good, but below the same vein does not give encouraging assays.

**The White Reserve mine** in the Maple Mountain district is again being worked by a Toronto and London syndicate. A good deal of leaf silver occurs in the wall rock, and this has been taken out and sacked. The Rubicon is also working the same section of the country.

**Penn-Canadian** development is still most promising. Both on the fourth level in the slates and the fifth in the conglomerate the spur of the Big Pete vein which has given this company most of its ore is looking very well. The average will probably be 2 in. of high grade with a good milling width. Diamond drilling under

the 210 ft. level under Glen lake. Soundings were taken by the company last fall.

**Scorodite.**—According to a bulletin of the Royal Society of Canada, Mr. J. B. Tyrrell has found another new mineral on the Nipissing. This is known as scorodite, and it was discovered in vein 49 of the Nipissing mine. The mineral has a coffee brown color, and is occasionally banded in different shades. Together with a paler yellow ochreous substance it encrusts massive nickeliforous smaltite and there are also associated with it erythrite, and on one of the specimens a few minute crystals of scorodite.

**The Hudson Bay** mill has closed down and only a few men are left in the mine cleaning up. Work is still proceeding at the No. 2 camp, where exploration work along the Cobalt Lake fault is proceeding.

The last monthly mill run resulted in the production of 25,000 to 30,000 oz. The company is now bending



On a Nipissing Canoe Route, Northern Ontario

the lake has shown the existence of promising stringers, which may be crosscut for and developed later.

**The Bailey** has gone into the hands of the permanent liquidator on the application of the former president, Mr. E. A. Benson, to whom, it is stated, the company owes over \$90,000.

The mine has probably never given better indications of paying back the money put into it than to-day, and in the three years when it has been systematically and scientifically developed it has paid back all charges and given a working balance of some few thousand dollars to the good. But the litigation with the old Cobalt Central was very costly, it having been fought in almost every court in Canada and the United States. The mine is shut down and the course of events appears to indicate that it will remain so for some little time to come.

**The Foster Leasing Co.** is pumping out the old Foster mine, with the intention of driving a crosscut from

its energies to develop the Dome Lake mine at Porcupine, in which property it has a controlling interest. It also owns some claims at Hangingstone Lake, near Gowganda, but it has abandoned them after finding and taking out some very rich but very short ore shoots.

Since it issued its 7,460 shares of stock in 1903 this company has paid \$1,940,250, or 25,000 per cent. on its issued capital. Nine thousand per cent. of this came from the sale of the Silver Queen claim in 1906, for which \$810,000 was paid. The big find on the company's property adjoining the Trethewey was made in 1907, and mine and mill have been producing steadily ever since.

**The pumping out of Cobalt lake** will not commence until October. By that time all preliminary work will have been completed. The dam at the foot of Short lake, near the south end of Cobalt lake, is making good progress. This work is 260 ft. long and will cost \$35,000. Another and much smaller dam is being built at



the south end of Pickerel lake. Excavations are being made for the pipe lines between Pickerel and Bass lake and also between the various mills which will be affected.

The big pumps are on the ground and can be installed at any time. In another five weeks further rock excavation will be made at the outlet and the level of the lake lowered 6 ft. and a half.

**Timiskaming Mining Co.** shipped two cars of ore in the week ending July 4th, and one in the week following. Nearly all the drills are now on development work.

**Buffalo.**—In the month of May the Buffalo mill run was as follows: Mill ran 634 hours; ore milled, 6,307 tons; average assay per ton before milling, 18.66 oz.; oz. silver recovered, \$93,326; silver paid for during the month, 173,747 oz.

**Trethewey.**—To the regret of the camp Mr. Horace Young is severing his connection with the Trethewey

**Trethewey Silver Cobalt Mining Co.** has declared a 5 per cent. dividend, payable July 15. This, the first mine to be actively worked in the Cobalt camp, has now returned to shareholders \$1,061,998, or 108 per cent.

**Gould.**—A shipment of seven tons of high grade ore was made this month from the Gould Consolidated lease on Cart Lake. The ore was taken from the extension of the Seneca-Superior vein. The winze has now been sunk 135 ft. below the 200 ft. level. Three big drills and one hammer drill are at work on the lease.

### LONGWALL MINING IN ILLINOIS.

Nearly all of the coal produced in the United States is mined by the room-and-pillar system or some modification of it. The longwall method of mining, so well adapted to many thin seams, is neither understood nor appreciated in the United States. The only field where longwall mining produces any considerable tonnage is



On a Nipissing Canoe Route, Northern Ontario

and the Cobalt camp at the same time on August 1st. Mr. Young came to the Trethewey two years ago as manager from the Hudson Bay mine. He has paid dividends and put as much ore in sight as he has taken out. Mr. Young leaves the Trethewey to go as consulting engineer with the Alquinian Development Co., Ltd., and general manager to the subsidiary companies of this holding syndicate. So far these consist of two properties—the Renfrew Molybdenum mines in eastern Ontario and the Julian Alaska Gold Mines in Alaska. The Alquinian is a Canadian company financed in Belgium.

**Gowganda.**—One of the most promising discoveries ever made on the Miller-Lake O'Brien mine has recently resulted in the opening up of an entirely new ore body at the 250 ft. level. Drifting on the cross vein, a vein which will average 3 in. of high grade ore, has been cut. It is running parallel to the main vein, but 600 ft. from it. It is in the diabase, whereas on the surface, where it was not of any particular importance, it was in the Keewatin.

in northern Illinois in Will, Woodford, Putnam, Marshall, La Salle, Grundy, and Bureau Counties. Bulletin 5, Coal Mining Practice in District 1 (longwall), by S. O. Andros issued by the Illinois Coal Mining Investigations describes in detail this method of mining. Longwall mines in this district produce over five million tons of coal annually or about 9 per cent. of the production of Illinois. The production of this tonnage is attended by 24.5 per cent. of the non-fatal accidents in coal mines in the state. The per capita production per employee is only 2.1 tons as compared with 4.5 tons for the state as a whole.

The longwall method of mining makes an almost complete extraction of the coal in the bed and produces about 15 per cent. more lump coal over 1 1/4 in. than is produced in Illinois room-and-pillar mines.

The bulletin is illustrated by 25 sketches and flash-light photographs which show every phase of this method of mining coal. Copies may be obtained upon request from the Illinois Coal Mining Investigations, Urbana, Illinois.

## MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Building,  
Toronto, Ont.).

New York Curb.		July 13.	
	Bid.	Asked	
American Marconi .....	2.87	2.37	
Alaska Gold .....	27.37	27.75	
British Copper .....	2.00	2.25	
Braden Copper .....	7.62	7.87	
California Oil .....	321.00	324.00	
Chino Copper .....	40.37	40.75	
Giroux Copper .....	.50	1.00	
Green Can. ....	28.00	30.00	
Granby. ....	75.00	85.00	
Miami Copper .....	22.00	22.50	
Nevada Copper .....	13.62	13.81	
Ohio Oil .....	178.00	180.00	
Rays Cons. Copper .....	21.00	21.37	
Standard Oil of N. Y. ....	214.00	216.00	
Standard Oil of N. J. ....	405.00	408.00	
Standard Oil (old) .....	138.00	.....	
Standard Oil (subs) .....	975.00	.....	
Tonopah Mining .....	6.62	6.87	
Tonopah Belmont .....	6.75	7.00	
Tonopah Merger .....	.38	.40	
Inspiration Copper .....	18.00	18.50	
Goldfield Cons .....	1.37	1.43	
Yukon Gold .....	2.25	2.37	

Porcupine Stocks.		Bid.	Asked
Apex. ....	.01½	.02½	
Dome Extension .....	.08	.08½	
Dome Lake .....	.38	.38½	
Dome Mines .....	9.10	9.35	
Eldorado. ....	.....	.....	
Foley O'Brien .....	.25	.27	
Hollinger. ....	18.75	19.00	
Jupiter. ....	.07	.08	
McIntyre. ....	.25	.27	
Moneta. ....	.....	.04	
North Dome .....	.....	.05	
Northern Exploration .....	1.00	2.50	
Pearl Lake .....	.03	.03½	
Plenaurem. ....	.....	.40	
Porcupine Vipond .....	.27½	.28½	
Imperial. ....	.01	.01½	
Porcupine Reserve .....	.....	.....	
Preston East Dome .....	.01¼	.06¾	
Rea. ....	.13	.20	
Standard. ....	.00½	.01	
Swastika. ....	.01¼	.01½	
United. ....	.....	.....	
West Dome .....	.06	.09	
Porcupine Crown .....	.85	.95	
Teck Hughes .....	.....	.....	

Cobalt Stocks.		Bid.	Asked
Bailey. ....	.00½	.01	
Beaver. ....	.24	.25	
Buffalo. ....	.90	1.00	
Canadian. ....	.08	.10	
Chambers Ferland .....	.17	.17½	
City of Cobalt .....	.39	.45	
Cobalt Lake .....	.44	.47	
Coniagas. ....	7.00	7.40	
Crown Reserve .....	1.15	1.18	
Foster. ....	.04	.06	
Gifford. ....	.....	.01	

Gould. ....	.....	.....
Great Northern .....	.06½	.07½
Hargraves. ....	.....	.02
Hudson Bay .....	57.00	58.00
Kerr Lake .....	5.10	5.20
La Rose .....	.90	.98
McKinley. ....	.54	.57
Nipissing. ....	5.70	5.75
Peterson Lake .....	.34	.34½
Right of Way .....	.02	.03
Rochester. ....	.....	.....
Leaf. ....	.....	.....
Cochrane. ....	.20	.24
Silver Queen .....	.....	.....
Timiskaming. ....	.12	.14
Trethewey. ....	.12	.17
Wettlaufer. ....	.05½	.06
Seneca Superior .....	2.25	2.50

## TORONTO MARKETS.

July 10—(Quotations from Canada Metal Co., Toronto):

Spelter, 5¼ cents per lb.
Lead, 5¼ cents per lb.
Tin, 34 cents per lb.
Antimony, 8½ cents per lb.
Copper, casting, 15 cents per lb.
Electrolytic, 15 cents per lb.
Ingot brass, yellow 10 cents per lb.
Ingot brass, red, 11 to 13 cents per lb.

July 10—Coal—(Quotations from Elias Rogers Co., Toronto):

Anthracite, \$7.50 per ton.
Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

July 8—Connellsville Coke, (f.o.b. ovens).

Furnace coke, prompt, \$1.75 to \$1.80 per ton.
Foundry coke, prompt, \$2.35 to \$2.50 per ton.

July 8—Tin, straits, 32.10.

Copper, Prime Lake, 14.00 to 14.25 cents.
Electrolytic copper, 13.70 to 13.80 cents.
Copper wire, 14.87½ to 15.12½ cents.
Lead, 3.90 cents.
Spelter, 4.95 to 5.00 cents.
Sheet zinc, (f.o.b. smelter), 7.00 cents.
Antimony, Cookson's, 7.05 to 7.15 cents.
Aluminum, 17.50 to 17.75 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, \$43.00 to \$44.00 per ounce.
Platinum, hard, 10 per cent., \$46.00 to \$47.50 per ounce.
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Bismuth, \$1.95 to \$2.15 per pound.

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" 27. ....	56½	26
" 29. ....	56¾	26½
" 30. ....	56½	26
July 1. ....	56¾	26½
" 2. ....	56¾	26½
" 3. ....	56¾	26½
" 4. ....	Holiday	26
" 6. ....	56¼	25½
" 7. ....	56¾	25½
" 8. ....	56¼	25½





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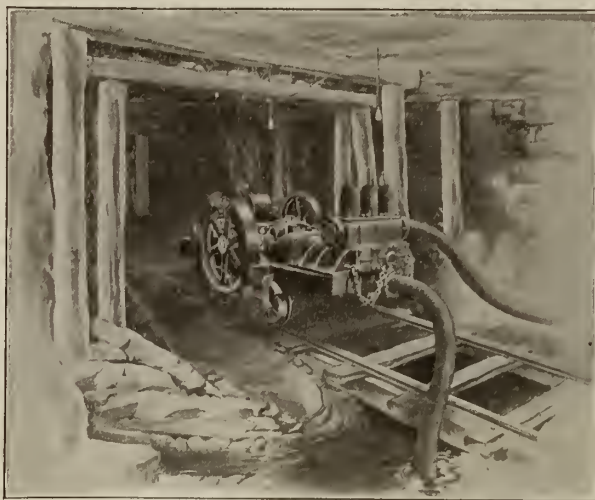
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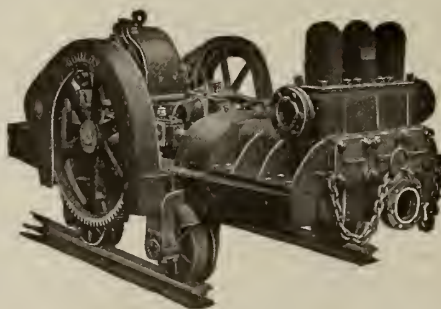


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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

**REPORTS RECENTLY ISSUED:****CANADA**

1240. Victoria Memorial Museum Bulletin No. 1. Contains short scientific papers.

**NEW BRUNSWICK and NOVA SCOTIA**

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

**QUEBEC**

Memoir 43. St. Hilaire (Beloeil) and Rougemont mountains, Quebec, by J. J. O'Neill.

**ONTARIO**

Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

**NORTH-WEST PROVINCES**

Memoir 30. The basins of Nelson and Churchill rivers, by William McInnes. Map not published.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

**BRITISH COLUMBIA**

Memoir 23. Geology of the coast and islands between the Strait of Georgia and Queen Charlotte Sound, B.C., by J. Austen Bancroft.

Memoir 36. Geology of the Victoria and Saanich Map areas, Vancouver Island, B.C., by Chas. H. Clapp. Maps not published.

**YUKON AND NORTH-WEST TERRITORIES**

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

**MAPS RECENTLY ISSUED:****CANADA**

Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

**NEW BRUNSWICK and NOVA SCOTIA**

Map 26A. Bathurst and vicinity, Gloucester County, New Brunswick. Topography.

Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.

Map 39A. Geological Map of Nova Scotia.

**QUEBEC**

Map 95A. Broadback River, Mistassini territory, Quebec. Geology.

Map 100A. Bell River, Quebec. Geology.

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Map 98A. Rainy Lake, Rainy River District, Ontario. Geology.

Map 49A. Orillia sheet, Simcoe and Ontario counties, Ontario. Topography.

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Map 96A. Wanipigow, Manigotagan, and Oiseau Rivers, Manitoba. Geology.

Map 103A. Southfork Coal Area, Old Man River, Alberta. Geology.

Map 107A. Blairmore, Alberta. Geology.

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Map 43A. Sooke Sheet, Vancouver Island, British Columbia. Topography.

Map 65A. Coast and islands between Strait of Georgia and Queen Charlotte Sound, British Columbia. Geology.

Map 92A. Coast and Islands between Queen Charlotte Sound and Burke Channel, British Columbia. Geology.

Map 99A. Southern portion of Cranbrook map area, East and West Kootenay, British Columbia. Geology.

Map 104A. Thompson River Valley, below Kamloops Lake, British Columbia. Geology.

Map 106A. Groundhog coal field, British Columbia. Geology.

**YUKON AND NORTH-WEST TERRITORIES.**

Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

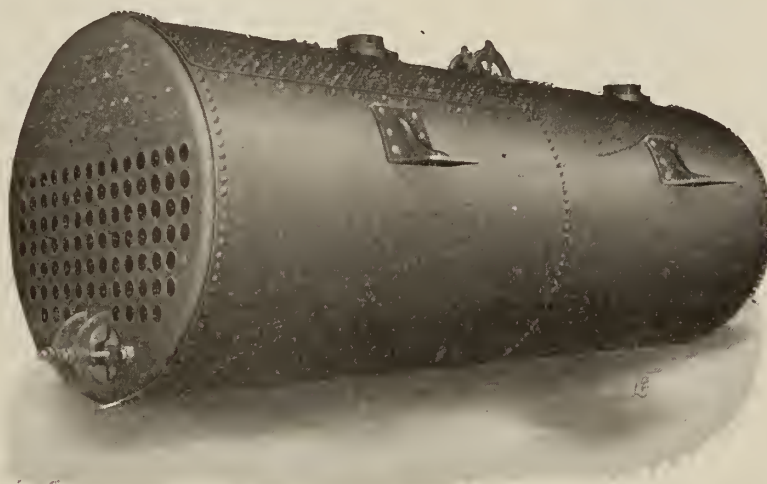
**NOTE.**—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

*Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.*



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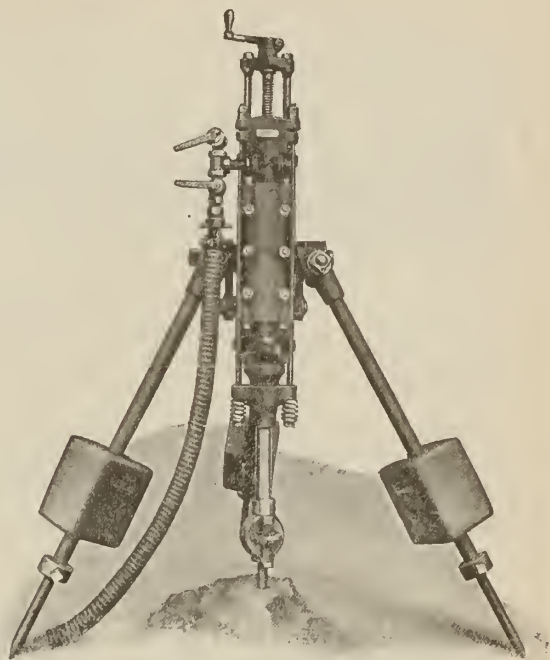


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The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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## Engines—Steam—

Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Oil—

Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

## Engines—Steam—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons  
Laurie & Lamb  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
The John Inglis Co., Ltd.

## Fans—Ventilating—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.

## Feeders—Ore—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.

## Filters—

Krupp, Fried. A. G., Germany

## Friction Hoists—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Forges—

Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.

## Forgings—

M. Beatty & Sons  
Canadian Cleveland Drill Co.  
Smart-Turner Machine Co.  
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We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

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MANITOBA:	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,			Prince Rupert

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Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 32.)

**Furnaces—Assay—**

Krupp, Fried. A. G., Germany  
Lymans, Ltd.  
Mussens, Ltd.

**Fuse—**

Peacock Bros.  
Curtis & Harvey, (Canada),  
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Canadian Westinghouse  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

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Krupp, Fried. A. G., Germany  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

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Canadian Westinghouse  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.

**Hangers—Cable—**

Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.

**Hand Hoists—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Heaters—Feed Water—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Laurie & Lamb  
Canadian Westinghouse  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
G. Taylor Hardware Co., Ltd.

**High Speed Steel Twist Drills—**

Mussens, Ltd.  
Northern Canada Supply Co.

**Hoists—Air Electric and**

**Steam—**

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Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.

Jones & Glassco  
Waterous Engine Works  
M. Beatty & Sons

Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Siemens Co. of Canada, Ltd.

**Hoists, Chain, Electric and**

**Pneumatic—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Hoisting and Conveying Mach-**

**inery—**

Rock & Power Mach'y, Ltd.

Jenckes Machine Co., Ltd.

**Hoisting Engines—**

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Peacock Bros.

Can. Fairbanks-Morse Co.

Siemens Co. of Canada, Ltd.

Sullivan Machinery Co.

Fraser & Chalmers, Ltd.

Can. Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**

Rock & Power Mach'y, Ltd.

Mussens, Ltd.

Waterous Engine Works.

**Hose—**

H. W. Johns-Manville Co.

Mussens, Ltd.

Can. Fairbanks-Morse Co.

Can. Cleveland Drill Co.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.

**Jacks—**

Krupp, Fried. A. G., Germany

Mussens, Ltd.

Can. Fairbanks-Morse Co.

Can. Ingersoll-Rand Co., Ltd.

Northern Canada Supply Co.

**Jigs—**

Rock & Power Mach'y, Ltd.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

Canadian Allis-Chalmers, Ltd.

Roberts & Schaefer Co.

**Lamps—Acetylene—**

Mussens, Ltd.

G. Taylor Hardware Co., Ltd.

Northern Canada Supply Co.

**Lamps—Safety—**

Canadian Explosives

Peacock Bros.

Ackroyd & Best

Siemens Co. of Canada, Ltd.

**Link Belt—**

Waterous Engine Works

Northern Canada Supply Co.

Jones & Glassco

**Locomotives—Electric—**

Mussens, Ltd.

**Jeffrey Mfg. Co.**

Canadian Westinghouse  
Siemens Co. of Canada, Ltd.

**Locomotives—Steam—**

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Canadian Westinghouse

**Metal Merchants—**

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Geo. G. Blackwell Sons &  
Co.

Consolidated Mining and  
Smelting Co. of Canada

Canada Metal Co.

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Orford Copper Co.

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Mussens, Ltd.

Northern Electric Co., Ltd.

Can. Fairbanks-Morse Co.

G. Taylor Hardware Co., Ltd.

Canadian Westinghouse

Peacock Bros.

Siemens Co. of Canada, Ltd.

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Northern Canada Supply Co.

Geo. Taylor Hardware Co., Ltd.

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Can. Laboratories

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Campbell & Deyell

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Krupp, Fried. A. G., Germany

Orford Copper Co.

Canada Metal Co.

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Can. Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Northern Canada Supply Co.

**Pick Machines—**

Sullivan Machinery Co.

**Picks—Steel—**

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G. Taylor Hardware Co., Ltd.

Thos. & Wm. Smith

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G. Taylor Hardware Co., Ltd.

Can. Fairbanks-Morse Co.

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Smart-Turner Machine Co.

The John Inglis Co., Ltd.

A. M. Byers Co.

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Can. H. W. Johns-Manville

Mussens, Ltd.

Can. Fairbanks-Morse Co.

Canadian Westinghouse

Northern Canada Supply Co.

Geo. Taylor Hardware Co., Ltd.

**Pneumatic Chain Blocks—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Pneumatic Tools—**

Can. Cleveland Drill Co.

Can. Ingersoll-Rand Co., Ltd.

G. Taylor Hardware Co., Ltd.

Jones & Glassco

**Producer—Gas—**

Krupp, Fried. A. G., Germany

Mussens, Ltd.

**Prospecting Mills and Machin-**

**ery—**

Rock & Power Mach'y, Ltd.

Standard Diamond Drill Co.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

Can. Fairbanks-Morse Co.

Can. Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hang-**

**ings—**

G. Taylor Hardware Co., Ltd.

Krupp, Fried. A. G., Germany

Fraser & Chalmers, Ltd.

Northern Canada Supply Co.

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Can. Fairbanks-Morse Co.

Mussens, Ltd.

Northern Canada Supply Co.

Peacock Bros.

Canadian Ingersoll-Rand Co.,  
Ltd.

Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**

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G. Taylor Hardware Co., Ltd.

Mussens, Ltd.

Smart-Turner Machine Co.

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Thos. & Wm. Smith

M. Beatty & Sons

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Krupp, Fried. A. G., Germany

Mussens, Ltd.

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Can. Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

The John Inglis Co., Ltd.

Siemens Co. of Canada, Ltd.

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Mussens, Ltd.

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Can. Fairbanks-Morse Co.

Mussens, Ltd.

Can. Ingersoll-Rand Co., Ltd.

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Can. Ingersoll-Rand Co. Ltd.

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Thos. & Wm. Smith

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Can. Fairbanks-Morse Co.

Smart-Turner Machine Co.

G. Taylor Hardware Co., Ltd.

The John Inglis Co., Ltd.

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Rock & Power Mach'y, Ltd.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

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Ltd.

Can. Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

The John Inglis Co., Ltd.

**Pumps—Vacuum—**

Can. Fairbanks-Morse Co.

Smart-Turner Machine Co.

**Quarrying Machinery—**

Jenckes Machine Co., Ltd.

Rock & Power Mach'y, Ltd.

Can. Cleveland Drill Co.

Krupp, Fried. A. G., Germany

Sullivan Machinery Co.

Can. Ingersoll-Rand Co., Ltd.

**Rails—Mine—**

H. A. Drury Co., Ltd.

**Roasting Plants—**

Can. Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Krupp, Fried. A. G., Germany

**Rolling Mill Machinery—**

Krupp, Fried. A. G., Germany

**Rolls—Crushing—**

Rock & Power Mach'y, Ltd.

Mussens, Ltd.

Krupp, Fried. A. G., Germany

Fraser & Chalmers, Ltd.

Can. Allis-Chalmers, Ltd.

**Roofing—**

Paterson Mfg. Co.

Dominion Bridge Co.

Mussens, Ltd.

Northern Canada Supply Co.

Can. H. W. Johns-Manville

Geo. Taylor Hardware Co., Ltd.

**Rope Blocks—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Rope—Manilla and Jute—**

Jones & Glassco

Mussens, Ltd.

Can. Allis-Chalmers, Ltd.

Peacock Bros.

Northern Canada Supply Co.

Allan, Whyte & Co.

Thos. & Wm. Smith, Ltd.

**Rope—Wire—**

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Allan, Whyte & Co.

Northern Canada Supply Co.

Thos. & Wm. Smith

Fraser & Chalmers, Ltd.

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ber Co., Ltd.

G. Taylor Hardware Co., Ltd.

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The Herbert Morris Crane &  
Hoist Co., Ltd.

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Canadian Laboratories

Ledoux & Co.



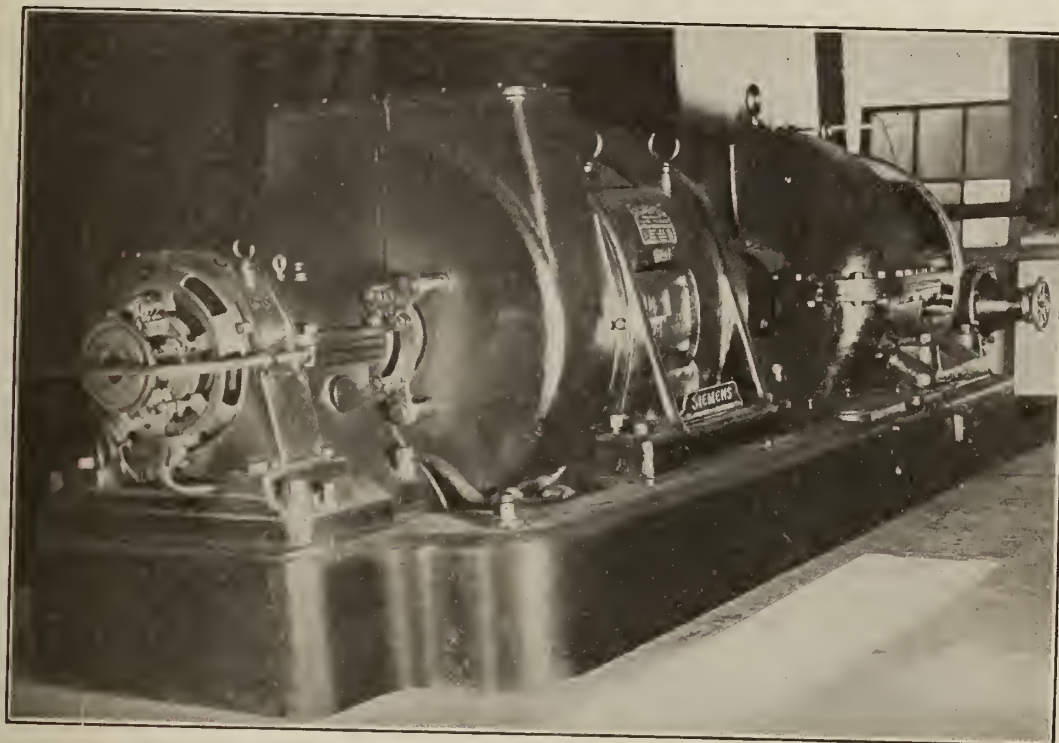
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| 1—2500 K.W. Dominion Coal Co. | 1—750 K.W. Nova Scotia Steel & Coal Co. |
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| 1—2000 K.W. Dawson City.      | 1—675 K.W. Medicine Hat.                |
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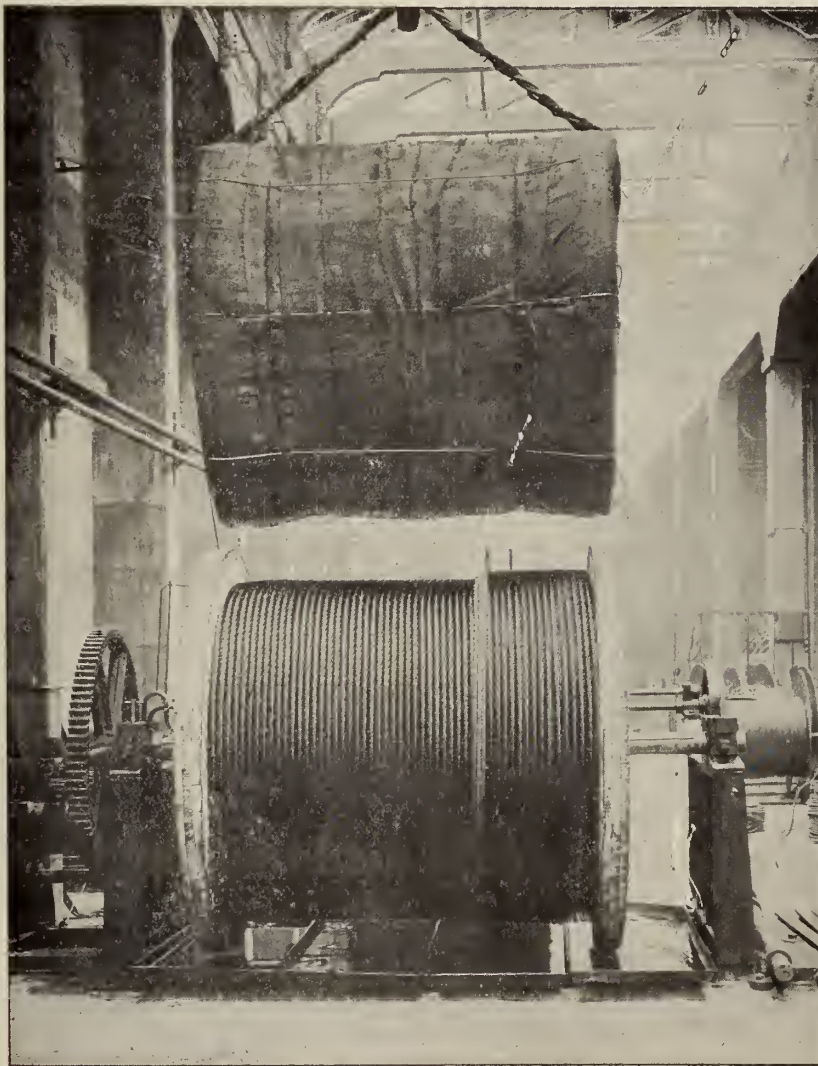
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TORONTO

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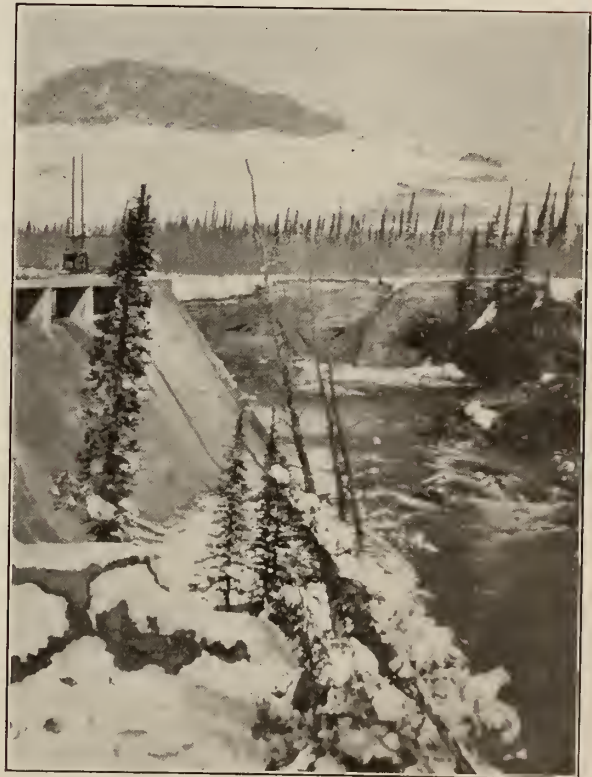
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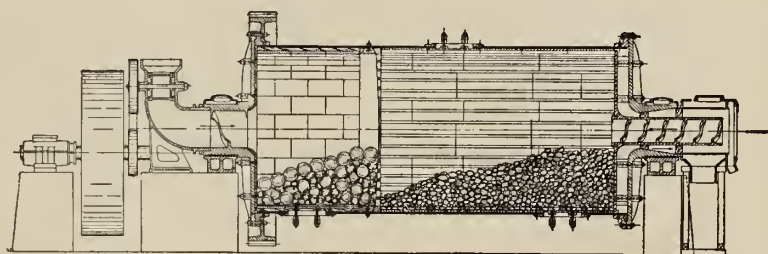
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This mill is intended for receiving the rock direct from the Crusher after it has been reduced to particles about  $\frac{1}{2}$  inch and finer.



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Bulletin 665A

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Spokane

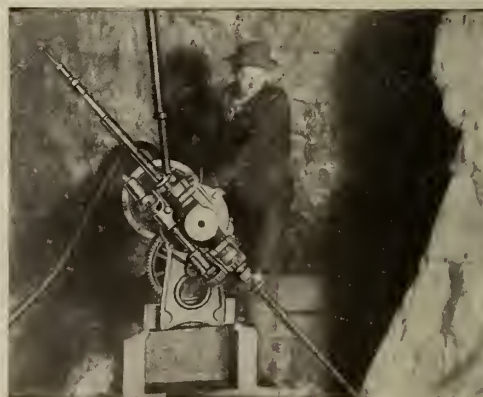
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Sydney Mines, N.S.,  
June 30-14.*

*Messrs. The Canadian Ingersoll-Rand Co., Ltd.  
Mr. J. P. Cotter, Agent,  
Sydney, N.S.*

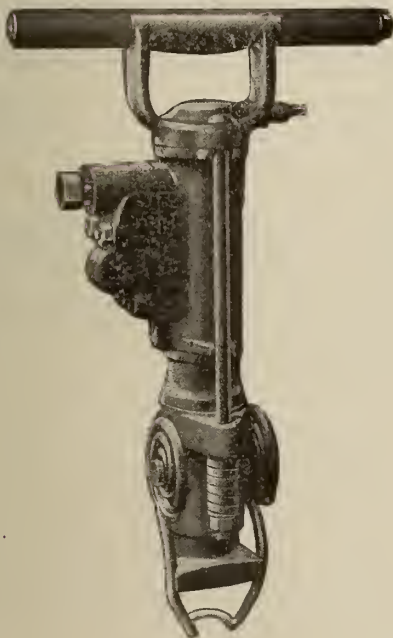
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found to contain iron stone balls, which at times made it  
difficult to drill, particularly when the drills came in contact  
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**JOHN JOHNSTON**

*Supt. of Mining*



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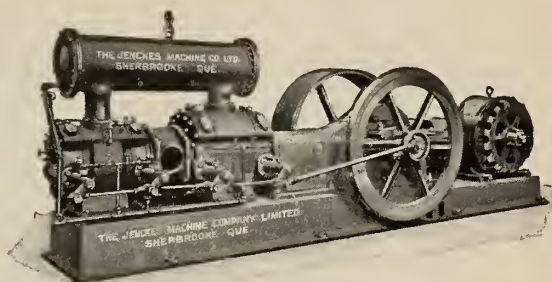
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## Synopsis of Coal Mining Regulations



**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal subdivisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B.—Unauthorized publication of this advertisement will not be paid for.—58782.

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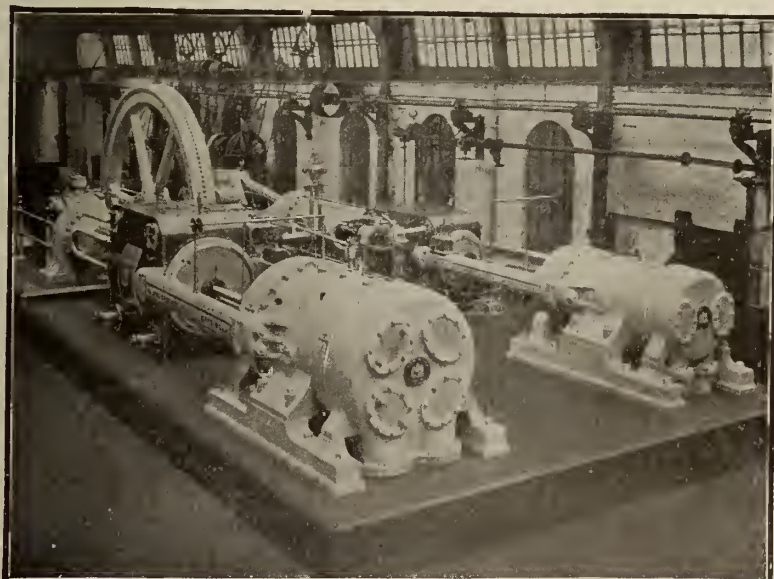
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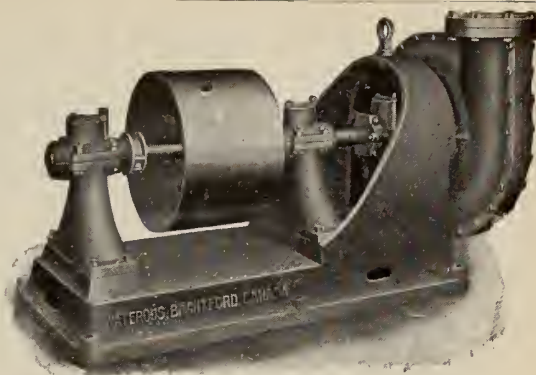
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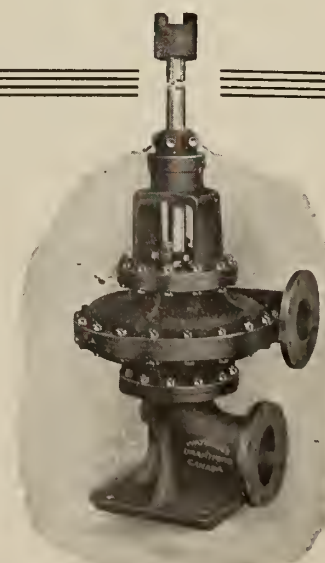
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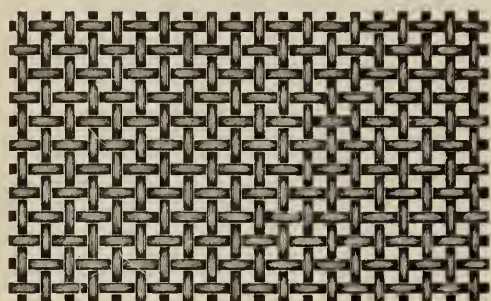
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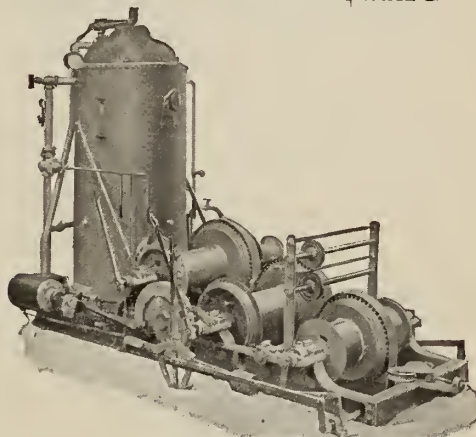
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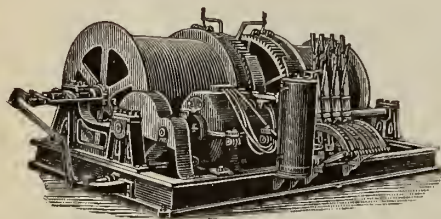
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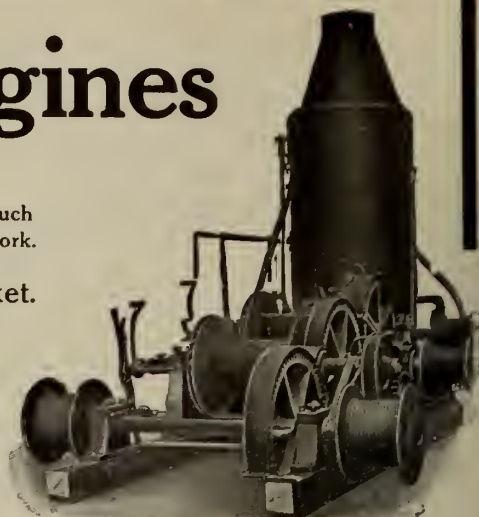
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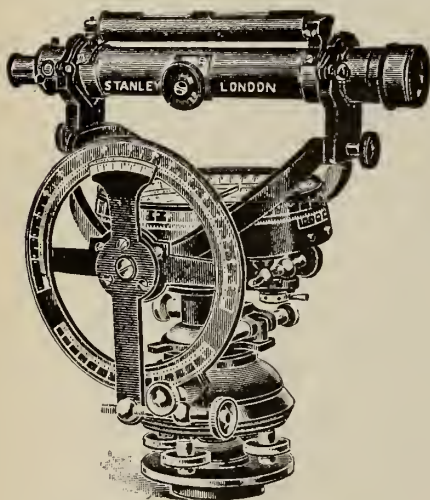
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Published April, 1914

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Member American Institute of Mining Engineers.

173 pages, 6x9, fully illustrated. \$1.50 (6/3) net, postpaid.

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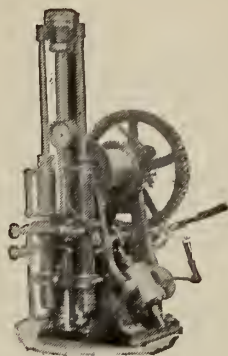
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Commissioner of Public Works and Mines,  
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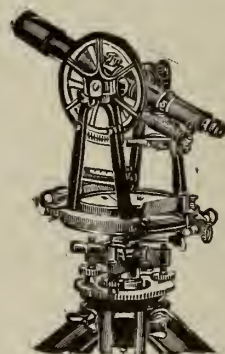
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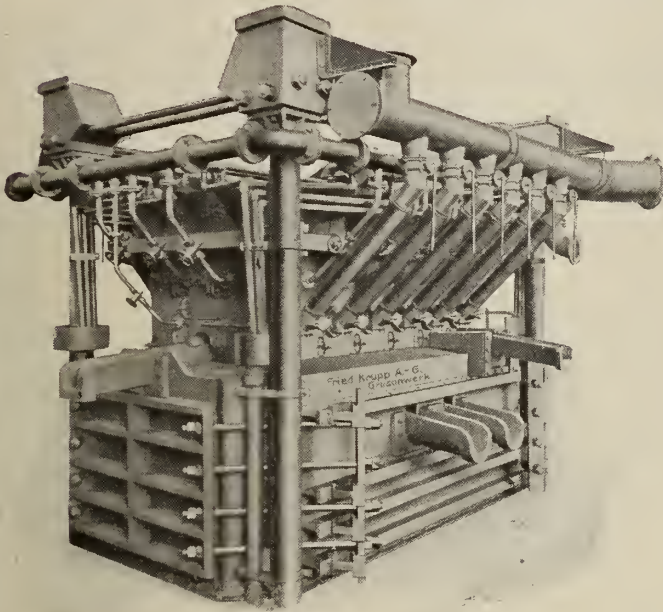
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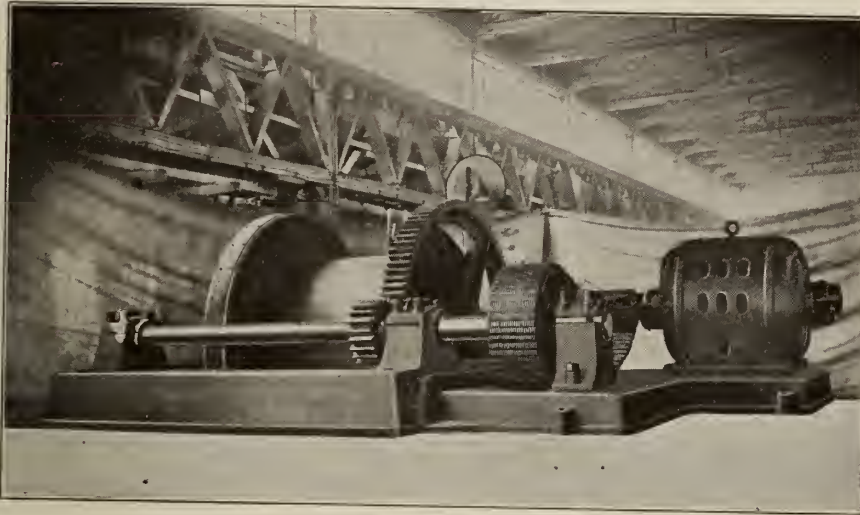
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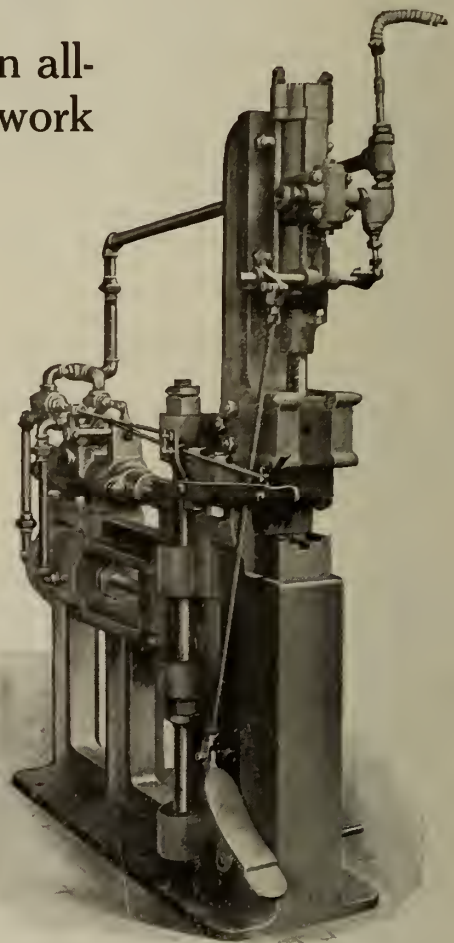
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# THE CANADIAN MINING JOURNAL

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## The Canadian Mining Journal

With which is incorporated the  
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Editor  
**REGINALD E. HORE**

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### CIRCULATION.

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## LIQUOR REGULATIONS

The regulation of the liquor traffic is, in most communities, unsatisfactory to at least some of the citizens. This is natural, for there is and probably always will be great difference of opinion concerning proposed measures for restricting the traffic. The laws must be made in accordance with the wishes of the majority, and if representatives keep faith with their constituents they are so made.

But there is in Canada too great a tendency to ignore the liquor laws. While our citizens generally are to be congratulated on their respect for the law, there is every evidence that many of us consider liquor regulations too lightly. This is certainly true in the mining districts. It is very unfortunate that it is true, for in these districts are many workingmen recently arrived from foreign countries and susceptible to impressions. They come into camps where we are told that the sale of intoxicating liquor is forbidden. According to our law it is. But the newcomers find no difficulty in procuring any amount of it. They laugh at our liquor regulations. Is it likely that they should have a very high opinion of Canadian laws in general?

These men become citizens of our country. Should we not endeavor to give them better first impressions? Why not enforce the laws or change them?

The non-enforcement of the liquor regulations is not peculiar to one district nor to one province. No one government is responsible. It seems to be the impression that lawlessness in mining districts is natural and to be expected.

Miners earn good wages and spend their money freely. Consequently there are in every prosperous camp many people who are willing to risk the penalty of breaking the law if they are thereby enabled to take in a large part of the miner's spending money. The miner accustomed to drinking in other countries is denied the right to purchase liquor in mining camps in Canada. There are good reasons why he should be and it is probable that if liquor were not obtainable in the camps it would be better for the miner. But it is obtainable. The "blind pigger" sees to that.

It is often stated that the laws are satisfactory, but that they are not enforced. Certainly there are many infringements and it does not seem that the mining camps in which the sale of liquor is prohibited are to be properly regarded as "dry" districts. It will always be difficult to enforce the law and especially so where the officers of the law are not in favor of it.

It is probable that much might be done to improve conditions without regard to the enactment or enforce-

ment of liquor regulations. Law and force are not the only means of fighting the liquor habit. Attention to the wants of the men may in many cases serve the purpose more satisfactorily. The man who works hard every day should not be regarded as a mere machine. When he is through with his work he wants rest and amusement. If these are readily obtainable he will not be a very good customer of the "blind pig," and he will be a better citizen and a more efficient worker.

Given comfortable homes and varied forms of amusement most miners are content without liquor. Denied these they resort to the "blind pigs" for diversion.

## THE IRON ORE TRADE

The demand for iron ore this year has been very poor and it is not surprising to learn that shipments from the Lake Superior States so far are several million tons less than for the corresponding period last year. Many iron mines are idle. Particularly regrettable is the effect on the iron mining industry in Canada. This has never been in very satisfactory condition; but a few companies have struggled along in spite of many difficulties. Given a good market for their product they would have a reasonable chance of success; but under present conditions profitable operation is hardly possible. It is to be hoped that the market will soon improve and that the operating companies will yet succeed in their efforts. Handicapped by the nature of the ore bodies they have had a hard struggle.

## MINERAL RESOURCES OF ALBERTA

For many years British Columbia has been widely known as a province rich in mineral wealth. The neighboring province of Alberta has, however, not been commonly regarded as one of promise for the prospector. As a matter of fact Alberta has enormous deposits of coal and many of the seams have been worked very profitably. There are a number of large mines in the western part of the province. Further east in the prairie section the coal lies in flat seams close to the surface and is mined in very many places.

The coal mined in the mountains is a very good grade of bituminous coal. That in the prairie section is a less valuable coal, but it is being used satisfactorily for several purposes. Much of it will not stand transportation, but is successfully used locally. There seems good reason to believe that methods will be devised to utilize such coal by briquetting it, distilling off volatile constituents or by burning it at the mine for the development of power. The possibilities offered will doubtless lead to the discovery of suitable methods for the use of these so-called lignite deposits.

For some years Alberta has been producing, notably in the vicinity of Medicine Hat, large quantities of natural gas. The successful developers of some of the gas fields believe that conditions in other parts of the province are promising for the occurrence of natural gas,

and it is expected that in the next few years many wells will be drilled in such districts.

While gas has been profitably produced for several years oil has as yet been produced in very small quantity in Alberta. For many years evidence of the occurrence of oil has been frequently referred to. Until recently, however, little drilling had been done.

Last fall the Calgary Petroleum Products Company found oil in the Sheep Creek district near Calgary. The oil is a so-called white oil and the discovery was regarded as of importance chiefly as an indicator of the probable occurrence of larger quantities of heavier oil in the neighborhood. Some months later a larger deposit of light colored oil was encountered in the same well at greater depth. Since then the prospects of locating a profitable oil deposit have been regarded as very good.

A number of companies have been formed for the purpose of drilling for oil in the Sheep Creek district, and the territory adjoining the "Discovery" well will be explored.

It is to be hoped that the expectations of the directors of the companies will be realized and that a profitable oil field will be developed. With further development of the coal and natural gas resources of the province and with an important oil field Alberta would assume a much more prominent position from a mining standpoint.

## KNIGHTHOOD FOR A CHIEF MINE INSPECTOR.

An unusual occurrence is the conferring of a knighthood on a mine inspector. The Colliery Guardian, of London, England, says:—

"The conferment of a knighthood upon Mr. Richard Augustine Studdert Redmayne, H. M. Chief Inspector of Mines, is a matter of no little interest to mining engineers. Mr. Redmayne was born on July 22, 1865, at South Dene, Gateshead-upon-Tyne. He was educated privately, and then passed through the Durham College of Physical Science. In 1883 he entered upon his apprenticeship at the Hutton Collieries, gaining his certificate in 1886. During 1891-3 he was in Natal, and in the latter year was appointed resident manager of the Seaton Delaval Collieries. This post he vacated in 1902 to take up the professorship of mining at Birmingham University, which he filled until 1908, when he was called upon to undertake missions for the Home Office, shortly afterward being appointed to the post of Chief Inspector of Mines, and head of the newly-created Mining Department at the Home Office. Since that time Mr. Redmayne has acted on every committee or commission engaged in the examination of problems relating to coal mining in Great Britain, an enumeration of which it is unnecessary to give here. Mr. Redmayne's literary activities have been considerable, being by no means confined to the numerous official reports that have been issued above his signature; he is the author of 'Modern Practice in Mining,' which, we believe, is still incomplete; joint author with Mr. F. H. Bulman, of 'Colliery Working and Management,' and for some years edited the 'Colliery Manager's Pocket Book.' It may be added that the Chief Inspector is related by marriage to the Prime Minister."



## THE HILLCREST DISASTER

The great elements of danger in coal mining are gas and coal dust. Every precaution is taken to prevent the ignition of these by the use of approved safety lamps and permitted explosives. Shooting is not permitted where gas has been found and all shots are fired by shotlighters. Notwithstanding all these precautions explosions occur, and in the case of coal mining in the Crowsnest district, where the coal rolls down chutes to the level below, there is necessarily considerable dust made. When one considers that experiment has proven that an explosion was obtained when coal dust was present only to the extent of about one-fifth of an ounce per square ft. (this is much less than the dust present in the roadways of many mines), it can be seen how important the dust problem becomes.

Many remedies have been proposed to render the galleries of a coal mine safe from coal dust explosions, the chief of which are:

1. Removal of the dust by shovelling.

## BEAVER LAKE.

In view of the recent discoveries of gold in the Beaver Lake district, Saskatchewan, the article by Mr. E. L. Bruce, of the Geological Survey staff, in this issue has a special interest.

## WEST SHINING TREE.

Good reports come from West Shining Tree district. Gold was discovered there a few years ago, but there has as yet been little work done in addition to the exploration carried on by the holders of the claims. The prospectors bring out good specimens of ore, and believe that they have valuable properties. It is to be hoped that a development company will undertake the thorough development of some of the claims. Some of the prospects are quite attractive.

## GAS IN NEW BRUNSWICK.

Maritime Oilfields, Ltd., reports that in deepening well No. 36, and after passing through a bed of shale and sandstone, a gas sand giving a flow of 2,000,000 cu. ft. per day was struck on July 13. This result has



Mine Plan, Hillcrest Colliery, Alberta

2. Watering by sprays, etc.
3. The provision of "stone dust" or of "wet" zones on the main roads of the mine.
4. Use of salt, calcium-chloride or other inexpensive deliquescent compounds.
5. Intermixture of stone or shale dust by sprinkling the roads with the same.
6. Prohibition of dry tamping in shot firing.
7. Prohibition of coal dust tamping in any form.

It is hoped that the investigation be not only confined to the cause of the disaster at Hillcrest, but that it may be extended to cover all coal mining operations in the Crowsnest district.

Another proper field of usefulness would be in the Government taking some action towards educating the miners with regard to the nature and hazard of the work. The importance of this matter should not be neglected because, on account of the scarcity of miners in the West, the operators have to employ men with little or no experience in coal mining. In coal mining the safety of the mine depends to a certain extent on the intelligence of the least intelligent man employed, or, in other words, it is possible for the least intelligent man to blow up the whole mine.

W. J. D.

been obtained by pursuance of a programme outlined by Dr. Henderson for the deepening of the wells, and we are pleased to learn of the success of this work

The Westinghouse strike at East Pittsburg was called off by the workmen on Thursday, July 9th. While the day set for return to work was Monday, July 13th, a large number of the men reported on the Friday and Saturday preceding. The works are now running full time.

Mr. Frank Robbins, who died at Los Angeles, California, U.S.A., on June 21, was a mining engineer well known on the Pacific Coast—in California, which had been his home for a number of years; in British Columbia, where, before he removed to Los Angeles, he was in charge of mines for Mackenzie and Mann, Toronto, first at the North Star in East Kootenay and afterward at the Brooklyn and Stenwinder at Phoenix, Boundary district; at Leadville, Colorado; and in other parts of the West. He had also been connected with mining in Honduras. For about 17 years he was a member of the American Institute of Mining Engineers. As a consulting engineer he had business connections over a wide extent of country. His death resulted after only a short illness with pneumonia.



# BEAVER LAKE MINING DISTRICT, SASKATCHEWAN\*

By E. L. Bruce.

Beaver or Amisk lake lies in the Province of Saskatchewan just west of the provincial boundary. It is three miles west of the 102nd meridian and about 20 miles south of the 55th parallel of latitude. From Winnipeg it may be reached by two routes. The more direct is by the Canadian Northern Railway to Hudson Bay Junction, and thence by the Hudson Railway to Pas on the Saskatchewan river. From that point motor boats run regularly to Cumberland House, the Hudson Bay Company's post on Cumberland Lake, and from there north to the upper end of Namen or Sturgeon lake. From this lake a wagon road has been recently cut to Beaver lake, a distance of about 18 miles. The river from Beaver lake to Sturgeon lake is swift and difficult and is now little used by parties going north. The alternative route is by the Canadian Northern Railway to Prince Albert, thence down the Saskatchewan to Cumberland river, and up that stream to Cumberland House. It is somewhat longer than the route by the Pas, but has the advantage of being mostly down stream. The distance from Pas to Beaver lake is about one hundred and twenty-five miles and the trip requires two and a half to three days. A motor boat for the conveyance of passengers and freight is now running on Beaver lake. A canoe route leads up Sturgeon Weir river to the lakes to the north and others lead eastward to Athapapuskow and Cranberry lakes.

## Topography.

Beaver lake itself is a fine body of clear water, 18 miles from north to south by about nine miles east and west. It contains hundreds of islands varying in size from mere rocks to Missi or Grand island, six miles in diameter and occupying most of the north half of the lake. The lake lies across the contact of the Palaeozoic and Pre-Cambrian rocks. The country around the south end is flat and unbroken, being largely a structural surface. The contact of the limestones with the older rocks is usually marked by a low escarpment. The country around the northern half is of low relief, but consists of narrow northerly-trending ridges separated by swamps and muskegs. Rock is abundantly exposed, but the difference in elevation is never over 50 ft. The influence of the different rock types on the topography is pronounced. The southern end of the lake is characterized by smooth curves and shingly beaches; the northern end is exceedingly irregular, and the shores consist of rocky points separated by marshy bays.

## General Geology.

The geological column, as represented at Beaver lake, is as follows:

Recent—Peat.

Palaeozoic—Ordovician.

Pre-Cambrian—Granite intrusion.

Missi formation.

Amisk series.

**Amisk series.**—The Amisk series is by far the most extensive. The rock types are largely massive greenstones, often showing ellipsoidal weathering. The schists developed from rocks of this type. The strike

of the schistosity is usually northerly; but variations are frequent. On the point north of the mouth of Sturgeon Weir river the strike is nearly east and west, and the same direction holds for some of the schists north of the lake. Along the west shore the schists have strongly contorted laminae. Some granular rocks of the type of diorites or altered diabases and some amygdaloidal lavas occur. A few exposures show a rather fresh looking light greyish felsite inter-laminated with green schists.

**Missi formations.**—At the north end of the lake and crossing on to Missi island is a narrow band of conglomerate, striking nearly north and south. It has a well marked schistosity parallel to the strike of the band and to the Amisk series adjacent. The dip is almost vertical. The pebbles are chiefly disc-shaped fragments and well rounded pieces of quartz. Fragments of felsites and jasper are in minor amount, but typical granites do not seem to be represented. The size varies from sand particles to a diameter of a foot or more. The matrix is a rather coarse grained arkosic material. The arrangement of the pebbles is very irregular and lenses sometimes occur without pebbles. The flat schist pebbles usually lie with their long axes parallel to the schistosity, but this arrangement seems to have been original rather than induced, and therefore the present schistosity is parallel to the original bedding of the sediment. Occurring as bands and lenses is strongly schistose deep-green rock that in appearance and degree of alteration is so like the Amisk greenstone that, without the evidence of the associated fragmental formation carrying fragments of true Amisk rocks, it would undoubtedly be classed with the older formation. The rocks on Missi island immediately west of the Missi formation are greenstones with striking pillow structure.

**Later granite.**—A narrow belt of rather fine grained biotite granite intrudes the greenstones and schists on the west side of the lake. This tongue lies from a few chains to a mile and a half from the shore, and is variable in width, possibly discontinuous. Its maximum breadth is a half mile. Dykes from this main tongue are numerous along the lake. No tongues have been found cutting the conglomerate, but the failure of granitic pebbles in the fragmental rock, as well as the unsqueezed character of the igneous rock, seems to argue that the granite is of later age.

**Palaeozoic.**—Covering the Pre-Cambrian formations is the mantle of Ordovician sediments. These consist of limestones, sometimes arenaceous. They vary in color from light buff to variegated, to reddish, the latter apparently uppermost.

**Glacial and recent.**—This region was one of intense erosion during the glacial period, but deposits of glacial debris are not important.

## Economic Geology.

**Gold.**—The first gold discoveries were made by Messrs. Mosher and Creighton in August, 1913. Since that time a large part of the country around the north end of the lake has been staked. Many of these claims are of the usual type located during a gold rush. Even on claims where quartz veins have been found little work has been done.

\*Published by permission of the Director of the Geological Survey, Canada.



**Prince Albert claim.**—Up to the present real development work is confined to that being done on the Prince Albert claim of the Mosher-Creighton group. The vein has been traced for a distance of two hundred feet and a shaft is now down 25 ft. The vein is in a schistose band in the greenstone. The strike of both schist and vein is north and south. The dip is 60 degrees to the west. The vein is variable in width, ranging from 2 ft. to 9 ft. at its junction with a 20 in. subsidiary vein. Native gold is present in visible amount, and the schist adjacent to the vein is said to carry values. Other metallic minerals are present only in small amounts. Some of these are: Arsenopyrite, usually in crystals in the wall rock; a very little chalcopyrite, with carbonates from its alteration; molybdenite, and possibly some galena and stibnite. The gangue is quartz with some calcite. The quartz is variable in color, being milky white, bluish, pinkish or a variegated brownish color. In most of the samples examined the visible gold seems to lie chiefly along irregular dark greenish lines or along slip planes which are coated with a yellow micaceous mineral. Sometimes, however, it is in solid quartz.

**The Monarch vein**, on a small island just east of Prince Albert claim, has not been developed, but apparently has a considerable width. It strikes N.80°W. Other finds of visible gold are reported from Copper lake, just east of Beaver lake, but these have not yet been examined.

The region is heavily timbered and so far has not been thoroughly prospected even on located claims. However, with the improvement of transportation facilities, the holders of these properties will no doubt proceed to examine them properly. In the veins already being worked careful and systematic development to prove payable values both along the strike and in depth is necessary. On the whole the Beaver lake region seems to be a not unpromising field for legitimate investigation.

#### GRANBY CONSOLIDATED.

Boston—The Granby Consolidated Mining, Smelting & Power Co. completed the most important year in its history on June 30, for in that twelvemonth there was equipped and put into operation the Hidden Creek property at Anyox.

The company produced approximately 21,000,000 lb. of copper in its fiscal period just ended comparing with 22,688,614 in the preceding year. Just how much profit was derived from this yield has not been determined, but the margin between costs and receipts was at no time great. In fact, dividends paid during the twelvemonth were not at all times fully earned.

Costs at Grand Forks ranged between 10 1-2 cents and 11 cents a pound. The new Hidden Creek property, which was put in commission several months ago, showed from the first a slight operating profit.

The company now has a fixed charge in the way of interest on \$1,500,000 convertible bonds and has maintained dividends at the rate of \$6 a year.

In the near future the Midas mine in Alaska should be in position to ship ores to the Hidden Creek smelter. By reason of their precious metals contents the cost of production will be exceedingly small.

The annual stockholders' meeting will be held in New York in October, at which time there will probably be two changes in the board of directors.—Boston News Bureau.

#### CLAY DEPOSITS OF NEW BRUNSWICK.

In a bulletin published by the Geological Survey, Mr. J. Keele states that up to the present time the clay deposits of New Brunswick have only been developed to a very limited extent. Wooden construction prevails, to the exclusion of almost all other kinds, except in the business portions of the cities and towns, because lumber has hitherto been plentiful and cheap in this Province. The danger from extensive fires is always present when wooden construction is so freely used in closely built communities. This was evident in the total destruction of the town of Campbellton by fire during the summer of 1910. Since then the demand for structural clay wares is increasing, but they are not yet used as largely as they might be, because everything except common brick has to be imported.

New Brunswick possesses in its Carboniferous rocks certain shale beds, adapted for making those higher grades of claywares which cannot be produced in the Provinces of Quebec or Ontario, where these raw materials are absent.

Proximity to markets, although desirable, is not so essential to manufacturers of the higher grades of clay wares, such as face bricks, paving bricks, sewer pipe, electrical conduits, fireproofing, etc., as these materials are frequently transported for long distances. A plant equipped for a large output of common brick can only be maintained close to cities, where the demand for them is constant during the greater part of the year. These plants frequently represent a considerable expenditure of capital, being furnished with artificial driers, continuous kilns, and machinery driven by steam or electric power. The surface clays can be worked in a primitive manner, with a small outlay of capital, to suit the demands of small towns or rural communities. Such plants are able to maintain their position, because the price of common brick would not pay the cost of carriage from large centres where their manufacture is carried on more scientifically.

When the need for underdraining the cultivated areas in the province becomes more generally known, these clays will have a much wider application. Drain tile can be made from the surface clays. Tile are made from stiff mud, usually by an auger machine having a circular die, although different styles of plunger machines and also hand presses are used in their manufacture. They are made in sizes varying in diameter from 2 in. to 3 ft. Any means of drying and burning may be used with the smaller sizes, but the larger sizes require considerable care to prevent cracking. Contrary to the popular notion, it is not necessary for drain tile to be porous, so that they should be hard burned. Besides sufficient hardness, the important requirements for drain tile are straightness, uniformity of diameter and smoothness of ends.

The only pottery in operation in the Province is located at St. John, on Loch Lomond Road. It is owned by J. W. Foley and Co., who manufacture butter crocks, teapots, jars and flower pots. Most of the raw material is imported from the State of New Jersey.

State Mineralogist F. McN. Hamilton announces the publication of Bulletin No. 67, "Minerals of California," available for distribution July 1, 1914. Price \$1.00. This work which is a cloth bound volume of 250 pages has been written by A. S. Eakle, Ph.D., Professor of Mineralogy in the University of California, and is the result of many years of research and study of the minerals of the State.



## PROFESSIONAL ETHICS\*

By Dr. Rossiter W. Raymond, Ph.D., LL.D.

Perhaps the deepest and sharpest distinction in a man's relations to his fellow-men is the distinction between war and peace. He who takes the life of an enemy, may lay down his own life for a friend. But the progress of civilization and religion has tended to diminish this distinction, first, by abolishing private wars and restricting the practice of war to conflicts waged between organized political groups, and, secondly, by limiting the rights of such belligerents, and protecting the rights of neutrals, non-combatants, even of soldiers and of prisoners of war. Nevertheless war is still purgatory, though it need not be unmitigated hell; and apart from the lawlessness, cruelty and suffering which still accompany it, perhaps its greatest evil result is its corruption of the ways and habits of peace.

Accustomed in war, even when humanely conducted, to deceive, surprise and outwit the enemy, to capture, disable or kill his active soldiers, and, at the very least, to destroy or carry off such property as might be useful to him or to ourselves in the struggle, we transfer these habits into those contests of peace which we can figuratively describe as war. Fair notice has been given, let the adversary beware! CAVEAT EMPTOR! Let the purchaser look out for his own interests, so long as we do not warrant the horse or the goods, or do give him the opportunity to have his own expert examine the mine! Some people, professing to believe that labor and capital are at war, and that every interval of peace between them is only an armed truce, justify acts of violence and treachery as acts of war. Hysterical women declare that the breaking of laws and of windows, and all varieties of malicious mischief from riot to arson are necessary incidents to a holy warfare. And if we descend to the class of professional criminals, we find that even they satisfy what remaining conscience they possess by the theory that they are at war with society, with the world that owes them a living and hasn't paid the debt, or with the rich whom it is their duty, as champions of the poor, to plunder. Through all these and many other developments of crude and selfish ethics runs the demoralizing maxim that "the end justifies the means," the end being always a victory of some kind, which is regarded as rightly desirable and supremely important. This prevented reasoning, I repeat, is the legacy left to us by wars between nations. And the worst of it is, that in practising the ethics of war in private relations, men do not always obey the humane regulations and restrictions with which civilized nations have gradually limited the practice of public war. The warriors of peace will sometimes be guilty of acts, such as the wanton injury of neutrals and non-combatants, which have been outlawed in war. Our ethics of peace are based on the Golden Rule, under which we are to do unto others what we would have them do unto us. Yet this rule needs interpretation. Sanely construed, it means that we should treat others as we ought to wish them to treat us. It does not require us to give money to a lazy and worthless beggar, because if we were beggars of that sort, we would like to get, by simple asking, the price of a drink. Moreover, even when sanely interpreted, the Golden Rule depends in operation upon our notion of what is best for our neighbor, and would be best for us. This rule was formulated,

in substance, first by Confucius, and afterwards by Christ. It therefore underlies the ethical systems of two great groups of nations comprising the greater part of the population of the world. Yet how differently it operates in these systems! We consider truth and honesty as the basis of our code. Confucius made brotherly kindness the basis of his. "Don't lie whatever you do!" is our maxim. "Don't give pain, if you can possibly avoid it," is the Confucius rule. Thus you will find in the Analects of Confucius a direction, substantially as follows: "If a man calls upon you to solicit a favor which you cannot grant, do not say, No; tell him to call again, and thus delay his final disappointment!"

I do not mean to waste your time and my strength in discussing the ultimate basis of ethics, or the difference between systems. Let me come at once to the consideration of my subject of professional ethics, as based, among us, on the principles of honesty, justice and fair play. I shall not go into the higher realm of love, in which a man sacrifices his life for others. Such altruism is not the rule of life. We may admire and reverence it, when it is not only nobly unselfish but also sane. But we cannot imagine a worse organization of human society than one in which everybody is trying to sacrifice himself, and justice is swamped in hysterical generosity. We must be just—just to ourselves, our generation and the permanent interests of our race, before we can know, even, how to be generous.

Under the term "professional ethics," I mean, not any code or set of codes, different from that general system which we recognize as binding upon us all, but the application of that system to problems peculiar to different professions. For, as I think, people generally mean to be honest and kindly and to play fair; but each class gets a training in certain directions, and is led to emphasize certain rules, which other folks, perhaps, not having had that training, do not instinctively obey.

Thus the Wall street broker, whatever other sins he may be guilty of, will calmly incur ruin, rather than go back on a bargain, made for him by a clerk, through a word or a sign in the howling crowd of the Stock Exchange. Or a merchant regards it as vital to his honor to meet his notes when they are due. He may be shifty in other ways; but he never dreams of neglecting the payment of his notes, or of supposing that his creditors will kindly wait without being asked to do so, or of regarding as a cruel oppressor any man who proceeds to collect his money when due. But take a clergyman or (in any State except Colorado!) a woman—in other words, a member of either of the two classes whom we most justly revere for their exalted, pure, unselfish lives—and you will discover that, to such an one, the man who has loaned money, and demands it again on the day when, although due, it cannot be conveniently paid, is a cruel oppressor, a member of that wicked "creditor class" against which legislators ought to legislate and preachers preach, and political parties produce platforms! If you doubt this proposition, just try to negotiate at a bank the note of a clergyman or (outside of Colorado) a woman!

The trouble in all such cases is that good people, meaning to do right, have had no ethics in the par-

\*Commencement address, Colorado School of Mines, May 22, 1914.



ticular sphere in which they exceptionally and occasionally act. Let me assume, my young brothers, that you are also without experience, and suggest to you some principles which may aid you in meeting the ethical problems of your own careers. This is, in fact, the only service that I, as a veteran lagging superfluous on the stage, can offer you. In every other respect, you know vastly more than I do. I can claim but one superiority over you; I have lived longer. If, according to Darwinian hypothesis, it is the fittest who survive, I can claim the dignity of a survivor! But even that will be lost before long; so let me use it while I can.

In treating of the ethics of your profession as engineers, chemists or metallurgists, you are under implied contracts, which professional ethics require you sacredly to fulfill.

**Authors.**—1. You will have to write technical papers or reports. Now, what are the ethics of such authorship? This is not an unnecessary inquiry. In my experience of some thirty years as editor of the writing of the ablest American engineers, I have found among the educated young men of this generation a serious ignorance on this point.

An author who is telling somebody his thoughts, has made a tacit agreement or contract with his reader. He practically promises, as the party of the first part, to the party of the second part, that he has paid attention to a certain subject, that he has something to say about it, and will undertake to say it so that the party of the second part can understand it. This is the agreement between author and reader; and the author has no right to violate any part of it.

Clauses misplaced are simply belated afterthoughts. Confused statement means confused studying, means that you have not thought out what you want to say, do not know what you are going to say, do not know how to say it, and have not tried to find out. You went on, possibly dictating to a stenographer (which is the besetting literary sin of our age), and communicated therefore to your reader, not the product of your thought, but the process. The reader does not care for the process; he wants the result. How many of us, writing in this slipshod way, have dragged our readers through the process, and have failed to give the product?

A mixed figure is often wrong morally. An orator who mixes a figure tells a falsehood. He professes to say to his hearer, "Behold! I have seen a picture, and it is thus, and so;" then state a thing which could not have been in a picture, and which he never could have seen.

I sat in the great Music Hall of Boston and heard Wendell Phillips say that the time would come in this country when "Liberty would stand by every newborn child, to drop in its cradle the school house and the ballot-box." He uttered not merely a mixed metaphor but also an implied and unconscious falsehood, because he professed to see in prophetic vision—a performance which would have been fatal to every American baby, and therefore not glorious reform, but the meanest kind of murder.

All joking apart, there is a serious ethical basis under the question of style. It is a debt that the author owes to the reader to tell him the truth; and a mixed figure is a lie.

Again, you ought not to conceal from your reader, by any device or evasion, or circumlocution, the extent of your knowledge. You ought not to pretend to know more than you do. For instance, you know Ger-

man. Most of you have to; and it is the best language outside of your own for a technical man to know. Now, suppose you get a German book, and there is in it a quotation from Plato or Pliny. You like to show culture; and when you write your paper you desire to quote this passage, and repeat it out of the German book, not out of Pliny. But most people do not quote Plato or Pliny or anybody else correctly; and you may have made yourself responsible for another man's error. You do not say, "I found this quoted in such and such a book." Now, that is a crime of authorship, to quote a thing you have not yourself seen in the original. If you found it somewhere else, say so in a footnote.

Again, do not use quotation marks unless you are citing the author's very words. Even that eminent historian, James Anthony Froude, fell into this sin. He was writing about Mary, Queen of Scots, and gave the substance of certain letters of the Queen and the ministers of Elizabeth enclosing in quotation marks words that they had not used, which gave only his idea of the substance of the letters. I think it was the Saturday Review which uttered the famous verdict, justly considered to express the utmost severity of condemnation. "Mr. Froude does not understand the meaning of quotation marks."

In my editing of the Transactions of the American Institute of Mining Engineers, a publication of more than one thousand pages octave every year, I have employed an assistant whose duty it was to look up quotations and references, and see that they were correct; and very often they were not! But I cannot stop to enlarge upon the niceties of authorship. Show perfect frankness concerning the extent and sources of your knowledge. Give every aid possible to your reader, if he should wish to go to the sources. All this is in the contract which you have made with him.

**Employees.**—2. In some capacity or other, you will become employees. Here also you enter into a contract, part of which is defined and enforced by the common law, while the rest is dictated by honor, and even by selfish interest. What you promise is not only service, but loyalty. Consider your duties and opportunities, rather than your present reward or your supposed rights.

Henry R. Worthington, my namesake, and a warm and helpful friend, once said to me. "I can find many young men who are competent to erect engines, but very few whom I can thoroughly trust to do it, in complete devotion to my interest as an employer. They are smart enough, but that does not prove that they are loyal enough."

Let me assure you who are younger, and call upon those who are older, to bear witness to the truth of what I say: There never was a time since civilization began or industry was set in motion by man, when loyalty was worth more than it is now. These enormous trusts and enterprises, one of the most magnificent of which adorns this city, are going to be ruined unless they find trustworthy employees. The time is past when the master could watch all the details.

The peril of the great enterprises of to-day is that they are breaking down the men at the head. It is not always the president; sometimes he is only a figure-head. But it will be the vice-president or the general manager. All these great combinations are, in my judgment, for that very reason, more dangerous to the body else. It is beyond the capacity of human brains to keep such big things going, unless they have trained and disciplined and retained a body of trustworthy



employees. Otherwise they will be ruined. That is the reason why the heads of great enterprises are looking for trustworthy men. Even had you no higher motive than your own welfare, you would be a fool to commence by looking out for yourself rather than your employer.

There is one situation testing, and, in our American history, brilliantly illustrating the loyalty of technical employees, which I cannot pass unnoticed, especially because it has received far too little recognition from press and public. I refer to the heroic courage with which the American managers of mines and metallurgical works have stood at their posts, defending the property entrusted to their charge against organized violence. The list is long—too long—already. It contains heroes and martyrs, but, so far as I know, not cowards. If it must become longer, by reason of the fear and folly of others, I pray God it may remain unstained and lustrous to the end.

**Business Agents—3.** You will have to act as business agents. In this case, your covenant is, that you will faithfully represent your principal, knowing no other interest than his. Perhaps the most troublesome question presented to young engineers is that of commissions. Let me tell you one case of my own. I went to buy for my employer a certain type of engine. I examined the various engines, found the kind wanted, and beat the price down by persistent negotiations until I got the very lowest price, and was just going to take the engine when the seller said, "Of course you are entitled to a commission on this purchase." I said I did not understand it so, that my services were being paid for by my principal, and I would prefer that he made a still lower price on the engine. But he said he could not make a lower price on the face of the bill, but was allowed, by a trade agreement with other men in the business, to give a commission to the agent. Now, had I been younger, I would have preached to that man. I would have said, "Sir, are you aware that you are offering me a moral insult?" But I had earned the custom of the trade, and I knew that what he said was true; that he could not reduce the face of the bill, though he could allow me a commission. "Well," I said, "I shall give it to my employer." Of course he smiled a bland smile and said that he had no objection to my giving it to whomsoever I wished. I wasted no time in further professions of honesty, but simply said, "I will take it; but I want it in a check to my order."

I took the check and endorsed it to my employer; and when I reported the purchase of the engine I said, "Here is a commission which they paid me." He looked at it; and he might have said "Good boy! you can have it." But he said nothing of the kind. What is more, it was not right that he should say it. I had been fully paid for my services; the commission belonged to him; and he knew it and I knew it. So I call your attention, not to any heroic virtue in my act, but to the common-sense which I exhibited in making my record plain. When it went back to the manufacturer, with my endorsement on it, he knew that I had given my commission to my principal, and there is the keynote to all such negotiations.

**Advisers.—4.** You will perhaps become advisers, either of private clients or of a public composed of investors unknown to you, or of courts of justice.

As the adviser of a private client, you should not have much difficulty as to professional ethics, except that at the beginning you ought not to let your client acquire a

false idea of your qualifications as an adviser. One of the most frequent forms of advice is the letter of recommendation. I have often had to recommend young men or answer questions as to their qualifications, and I have always, in such cases, written a private letter. Do not, if you can avoid it, give general letters of recommendation, addressed to nobody in particular. In the first place, they have no weight. In the second place, they are carried around until they are dirty and dogeared and unfit to present. In the third place, to give a man a letter about himself which he necessarily has an opportunity to read, is to throw suspicion upon the fulness of the communication. Even to the best of my friends, I give letters of recommendation in the following form: "To whoever receives your application for employment, I authorize you to use my name as reference, and if he will drop me a postal, I will answer confidentially and fully."

Then when I do answer fully, my duty as an adviser is to tell the truth. I must not write for the purpose of getting a place for a friend. I must not suppress anything that might affect unfavorably the success of that friend. I must advise the inquirer as though he had paid me for my honest opinion. And I frequently have to write in this way:

I have known the applicant for so long. I know him in such and such a way, and if he is given work of that nature, he will do it very well. The kind of thing you want, I do not know about, but I am very confident he will not tell you he is proficient unless he is. If he says he is, I believe he is; and if he says he does not understand it, I believe that he can pick it up if you give him a chance."

A letter of that kind, honest and complete, goes much farther than a general letter. I wrote such a letter recently for a young man who was in competition with a number of others for a position; and when he came back he said, "I got the place; he didn't pay any attention to the others."

In my special profession as a mining engineer, a curious case of causistry often arises. A person considering the purchase of certain mining property says to me, "Here is the report of the owner. I have agreed to take the property if that report is true; and I want you to verify it." At present I will not take such an order as that from anybody; and if you have the power to choose, I advise you not to do so. Yet there is nothing dishonorable in it. It is only difficult and liable to make trouble afterwards. You see that, under those circumstances, you have nothing to do except to say whether a certain statement is true or not. The statement may be true, and yet, in your judgment, there may be reasons why your client should not buy the property at the price named.

I prefer that my clients authorize me to advise simply whether they shall buy or not. Then I can return and say, "The statement is correct, but there is another property, equally valuable, right by the side of this one, for sale at half the money." Under the first form of order, I would not have the right to say that. I would be merely sent to examine into the truth of a certain statement. It is as if you were employed to decide whether a certain horse is sound. It would not be your duty to report, "Yes. The horse is sound but I know of another sound horse that could be got for less money." On the contrary, it would be your duty to hold your tongue as to everything except the precise questions you are employed to investigate. And the acceptance of a professional duty thus limited is perfectly honorable. On the other hand, it is your right and your interest to be protected against any



misuse of such a limited opinion, either by the garbling of your report, by suppressing its qualifying passages, or the use of it, in whole or part, as an endorsement of a scheme of which you had no knowledge, made no investigation, and would not have given a favorable opinion. Make your report in writing. Phrase it so that it cannot be innocently garbled. And if it should be thus misused, protest promptly. Don't come limping in, after a scheme has failed, to protest that you never meant to approve it in all respects. Speak quick, or shut up!

A word or two as to the duty of an expert witness in court. There has been a great deal said about "expert" testimony. Every once in a while some estimable gentleman cries, "Oh! This is all wrong. Just look at the way in which experts come into court and take thousands of dollars in fees for contradictory theories. The true principle is, that the court should appoint the experts, and the experts should have nothing to do with either party, but should simply enlighten the court." With that proposition I beg to differ. I have seen it tried in France, in Germany, and in England. Court experts were appointed, and published ponderous volumes, and could not agree. After all, gentlemen, let us confess that there is nothing so wholesome for us as to be set up before twelve men who know nothing about our business, and forced to try to teach them. I believe with all my soul that the best way to get the truth in a case of law involving scientific problems is to let experts be put forward by either side and cross-examined before judge and jury. They generally come out in their true size, no matter how inflated they were at the beginning.

We must recognize the fact, however, that, in almost every case of expert evidence, the expert is a partisan. It must be so. Nobody will pay expert fees, unless he knows what his expert is going to say. The proper course for you, as an expert, is to take pay in the beginning for the labor of examining the case and telling your client what you think of it. If your opinion is not useful to him, then drop out of the case. You cannot change your opinion honestly. But if you do drop out, you must not use the knowledge you have confidentially gained, either in that trial or in any other proceeding in which your client is involved. Your retainer should be as sacred as that of a lawyer; and a lawyer should be disbarred for such an act.

When your mind has been made up, the time for indecision is past. It was your business to make yourself thoroughly acquainted with the subject. If you are taken by surprise on the witness stand with a fact you did not know, you have failed in your preparation. But do not attempt to get out by evasion. An expert is sometimes taken by surprise, and in my judgment all he can say is, "I did not know of this fact. I have made up my mind after a careful study of the whole case. It is my honest opinion still. I have not had time to examine the relation of this fact to it. You may use this fact as much as you like. I cannot, at a moment's notice, frame a new opinion." That is the best way out of it. Any extemporaneous fencing with a lawyer brings a man to grief.

And for heaven's sake, do not be smart! Do not try to get the better of a lawyer in wit or repartee. You are fencing with one hand tied behind you; for you are under oath and he is not. I have seen many a witness beat a lawyer at repartee and then lose the case. On the contrary, I have seen many an honest witness confused and embarrassed, and the jury saw it, and gave him the case.

The best attitude for a witness is an impartial one. He must not seem to be fighting for his client. He should fight for his convictions and his theory; or rather, he should not fight at all, but assume that the examining lawyer is sincerely anxious to get at the truth of the matter, and give it to him with great courtesy and great affectation of frankness and esteem. The best witness I ever saw, spoke with such perfect freedom and pleasure whenever the opposing attorney asked insulting questions that the impertinence reacted in the witness's favor. But if you give provocation, your game is gone. You had better play the game of gentleman. If you do that the court will protect you from any insults. And if the cross-examining attorney says, "Answer me 'Yes' or 'No,'" do not commence to fence and dodge. Say, "As you ask the question, I answer 'Yes' (or 'No')"; and then request the privilege of explaining your answer. It is your right and you will get it.

In conclusion, is there not some handy rule which would help us in every case of doubt? The Golden Rule and the Ten Commandments we all want to keep; but they cannot always be applied in haste or with certainty. Let me suggest something practical, which has religion in it, but not enough to hurt or scare you. "Do not do what you cannot tell," or if there be good reason for not telling, at least "Do not do what you could not tell without shame." If it is a question, whether you should take a commission or whether your employer should have it, ask him; and then there is no trouble. If it is a question of practice, doubtful as to ethics, see how it would look in print.

Lately there has been a reign of hysteria in ethics, and it has gone too far no doubt. Nevertheless, without deciding whether this, that or the other thing is wrong, and while still believing in my own mind that many honorable men are being persecuted for having done things which only a short time ago all the world was doing without such criticism, I may draw out of all this the one pervading moral. How many of these things, if they had been done openly, would not plague the doers now? Here is a railroad company, formed, after the American fashion, to drive its tracks through the wilderness, building cities as it went. And (horrible to relate) it gave rebates to men who could help to build such cities. If the company had come out and said so, no one could have found fault justly. But it gave rebates and said nothing about it. In like manner, for many another thing, sometimes necessary, sometimes even wise, some hitherto reputable person or company has been made disreputable, and the real trouble is that the people who did it kept it secret.

There is another point about this matter of secrecy. When you keep a thing secret, you are not very likely to make a complete record of it. Now, there is nothing more foolish than not to keep your record perfectly clean. It is most humiliating to a man to be, after 30 years or so, unable to explain some particular payment, which he knows was honestly made, simply because the stubs in his check-book do not tell the particulars. Keep your memorandum book up to date and in good order, so that anyone can see them. If you are ordered to do a thing which you do not approve get the whole thing in writing, and make your record clear. We have been told upon the highest authority that men love darkness better than light when their deeds are evil. If you are not of such, why not walk in the light?



## EXTINGUISHING MINE FIRES BY HYDRAULIC FILLING

According to Charles Erzian in a bulletin published by the U. S. Bureau of Mines, the hydraulic method of mine filling is reported to have been employed as early as 1884 to extinguish a serious mine fire. The fire originated in one of the deep lifts or levels of a haulage slope in an anthracite mine, and after raging for several days was making its way among timbers and fallen coal to higher levels, where its extinguishment by methods then in use would have been very expensive and might have permanently ruined the mine. Water had been turned down the slope in flooding quantities at regular intervals with the hope of checking and extinguishing the flames. After considerable time had been lost in this manner with no apparent improvement or success, the idea of sending down culm mixed with water was conceived and applied. The intermittent flooding with water did not fill up crevices and openings in the debris and fallen coal and rock, but after culm had been flushed into the lower section of the slope for some time it filled the interstices of the fallen material, thus excluding the air and soon bringing the fire under control. Several years later hydraulic mine filling began to be generally employed for the purpose of extinguishing or smothering isolated mine fires, either by the direct filling of the workings affected or by the construction of temporary or permanent barriers. This practice is now common and is termed "sealing off a fire by the hydraulic-filling method."

The successful application of the various methods of extinguishing mine fires with large quantities of water, whether in steady streams, in pulsating streams, or in flooding quantities, or with mixtures of water and refuse material, depends to a great extent on the geological structure of the coal bed and the situation of the mine workings and the mine in relation to the available supply of water and "filler." At a mine operated at a considerable distance from available filling material it may be necessary to lay long pipe lines to a convenient surface location and to furnish expensive motive power.

The filler, after having been properly prepared, must be sent into the mine through a suitable opening. At many mines only bore holes are practicable. For such mines the best location of the bore hole is determined from examination of maps or other available data; sometimes from the best recollection of old-time miners. The latter necessity arises, in the case of old workings, because the maps of such workings, made at a time when the mining engineer or surveyor was seldom considered necessary, are incomplete or unsatisfactory.

The filler, after passing down the bore hole, flows unconfined into the inaccessible workings, causing blockages among the caves, and forming finally an effective permanent sealing pillar. In some mines this requires weeks of filling, and in other mines blockage is complete in less than a day. Under more favorable conditions, as in a mine where a fire may be in progress in "live" or producing workings and where the filler can be transported to and deposited at pre-determined points, the burning section is isolated so that the fire can not spread to adjacent workings, and the fire is allowed to burn to extinction within the sealed area.

The fire may be smothered by depositing filler in such a manner as to confine completely the burning district within well-defined bounds by filling the open-

ings so as to exclude air and thus cause such a deficiency of oxygen in the atmosphere that it will not support combustion. This method was used in a Wilkesbarre mine in which a fire had been in progress for some years. The burning area was on an antieline and the fire could not be extinguished by the usual methods of flooding. Bulkheads were constructed in the mine workings at lower points, and the open space inside of the bulkheads was filled by means of pipes which were run either above the bulkheads, along crosseuts and traveling ways, or through the bulkheads, so that they discharged some distance above the bulkheads, to insure absolutely air-tight blockage at the bulkheads.

### WILL OIL REPLACE COAL AS FUEL?

The world's production of crude petroleum in 1912 amounted to about 52,921,750 tons; the sources, respective quantities and percentages were as follows:

Country	1912 Tons (2000 lbs.)	P. C. of T'l Pro.
United States .....	32,897,060	62.16
Russia. . . . .	10,174,560	19.23
Mexico. . . . .	2,910,000	5.50
Roumania. . . . .	1,987,360	3.76
Dutch East Indies .....	1,672,000	3.16
Galicia. . . . .	1,298,620	2.45
India. . . . .	1,101,450	2.08
Canada. . . . .	38,750	0.073
Other countries .....	841,250	1.59

If the whole of this crude petroleum were employed as fuel in steam raising it would not replace, allowing for its higher thermal efficiency, much more than five and one-half per cent. of the world's output of coal, whilst if used in internal combustion engines it would be equivalent, as a source of power, to about 16 per cent. of the coal. Only a small proportion, however, of the crude petroleum can be regarded as available for use as a source of power, for by far the larger part is in demand as an illuminating agent and as a lubricant for machinery.

As the United States produces over 62 per cent. of the world's production of petroleum, it is interesting to note that Dr. Day, of the United States Geological Survey, considers that, at the present rate of increase of the output of petroleum, the known oilfields of the United States will, on the basis of the minimum quantity of oil obtainable, be exhausted by the year 1935, while, even if only the present output were maintained, the supply would, on the same basis, not last more than nineteen years.

In many countries there are, no doubt, vast tracts of undeveloped petroliferous territory, but only drilling can determine this. Even if the available deposits were far larger than there is reason to believe them to be, the cost of doubling the present output would be great. In view of these circumstances, it is not probable that there can be any general substitution of petroleum for coal as a source of power, although there is undoubtedly opportunity for making provision for a larger use of liquid fuel for certain purposes in which its advantages are conspicuous.—W. J. D.

### SESEKINIKA.

The discovery of gold by Messrs. Smith and Labine on a claim near Sesekinika, north of Swastika, is believed to be quite important. Several engineers have examined the vein and state that the showing is a very good one. So far as the actual value of the deposit is concerned, little is yet known; but the surface indications are regarded as promising.



## SMELTING MICHIGAN COPPER ORES

Michigan copper ores are comparatively easy to smelt. The operations are chiefly, (1) melting the concentrates and mass in reverberatory furnaces, (2) refining the copper and (3) recovering what copper goes into the slag.

The chief product of pure copper comes from the first melting. The concentrates and mass are melted without, (or in some cases with) fluxes in reverberatory furnaces, the slag formed by adhering rock is skimmed off as it forms, and the copper refined in the same furnace, or at one plant in a second furnace. The whole process takes one day for a small furnace, (capacity 30,000 pounds copper) and longer for larger charges (80,000-150,000 pounds). When one small furnace is used for both melting and refining, it is charged in the

test proves unsatisfactory the melt is rabbled and tested again before pouring. The completion of the poling operation is checked by a copper assay.

A smaller, but important, quantity of copper is obtained by treatment of the reverberatory slag. This is allowed to cool in deep pots and the copper settles to the bottom. The buttons are broken off and returned to the reverberatory furnace, while the slag, containing 15 to 30 per cent. copper, is melted in a cupola furnace with suitable fluxes. Limestone is added for all slags. For the ferruginous slag from conglomerate ore, a siliceous flux is necessary, and for the siliceous slags from amygdaloid ore, ferruginous fluxes must be added. Anthracite is added as a reducing agent. The fuel is coke and the anthracite.



Furnace and Walker Casting Machine, Michigan Smelter, Houghton, Mich.

afternoon, melting and skimming continued over night, and refining done in the morning. In refining, the melt is rabbled by compressed air several hours to oxidize impurities, principally iron and sulphur, which then come up to the surface and are skimmed off. In the process a little copper is oxidized. Some of the oxide is skimmed off with the impurities. The completion of the rabbling operation is determined by observation of the texture (granularity) of the copper in test buttons. When the original impurities have all been removed, the copper still contains some cuprous oxide—as much as 7 per cent. This is reduced by submerging wooden poles in the melt. Poling is continued until the copper is in the best possible physical condition. This point is determined by observing test buttons until a stage is reached at which they set flat on cooling. There is then still some cuprous oxide, but the metal is in its best physical condition, and without further poling it is poured into moulds. This is the final product ready for market, and unusually pure. In one plant the copper is tested for conductivity before pouring, and if the

The charge is treated slowly under a low pressure blast. As the melt is inclined to chill, deep crucibles are used to allow the copper to settle, and there is no forehearth. The slag is allowed to flow off continuously. The copper is run off at intervals and cast into blocks. These cupola blocks, containing small amounts of iron, sulphur and arsenic, are refined in the reverberatory furnaces in the same way as the copper formed on melting the original charge of ore and concentrates, but on account of greater impurity must be rabbled much longer.

To obviate dust loss in treating fine slimes, one smelter has a briquetting plant. The slimes are thoroughly mixed with lime and pressed into briquettes. These are sealed up in a steel cylinder and highly heated. They are then smelted with the reverberatory slag in a blast furnace.

At one plant the fines are melted in a reverberatory furnace and the product run off into pots. It is allowed to cool and then broken up for treatment in the blast furnace.



Casting methods differ at the different smelters. In some cases the ladle is brought over stationary moulds, while in others the moulds are moved up to the ladle. At the Quincy smelter the copper is dipped by hand ladles suspended from beams, so that they can be swung over the moulds. At the Lake Superior smelting works the moulds are brought up to the ladle on an endless chain. At the Michigan smelter, and at the newer furnaces of the Calumet & Hecla company, the moulds are brought up to the ladle by a Walker casting machine rotating in front of the furnace.

The copper is cast into several shapes, the most common of which are known as ingots, ingot bars, wire bars, cakes, slabs, billets and anodes. The ingots weigh about 20 pounds each, and are much used in manufacture of alloys. Ingot bars consist of two or three ingots joined together endways for convenience in shipping. For wire drawing, the copper is usually cast into rectangular bars, weighing about 225 pounds. Cakes, square or round, and weighing from 120 to 6,000 pounds are used for rolling into sheets. Slabs are thin cakes. Billets are for manufacture into seamless drawn tubes. Copper containing appreciable amounts of silver is cast into anodes for electrolytic recovery of the white metal. Some cupola blocks, containing considerable impurities, are recast into anodes for electrolytic refining. Until recently no electrolytic refining was done at the Michigan smelters; but the Calumet & Hecla Mining Co. has now in operation at Hubbell a splendid plant.

#### COLORIMETRIC ESTIMATION OF GOLD IN CYANIDE SOLUTIONS.

It sometimes happens that conditions of precipitation are disturbed temporarily, and frequent determinations of gold in barren solution are desirable in order to control the precipitation process. Time is not available for the ordinary assay, and a rapid method is required which can be performed by the foreman or shiftman in charge of the work. In discussing a paper on the metallurgy of the Homestake ore, presented to the Institution of Mining and Metallurgy by Messrs. A. J. Clark and W. J. Sharwood, Mr. Charles B. Brodigan recorded such a method devised by Mr. Dowsett, reduction officer at the Brakpan mines, South Africa.

With slight modifications, the method of Mr. Dowsett has since been adopted at the Homestake mill for testing barren solution, and we are advised that by its use the mill foremen are able to detect with surprising accuracy variations of 1 cent per ton, in solutions carrying from 1 up to about 15 cents per ton. Seven minutes is sufficient for a test, and the method is extremely useful when conditions of precipitation are unsettled and frequent determinations necessary. No standards are used, the grade of solution being estimated by the depth of color obtained. The color for a 1 or 2-cent solution is very faint, but is readily detected after a little practice. For successful work it is important that the cyanide solution used be of the highest possible strength.

In his original contribution Mr. Brodigan states: "If gold is present to the extent of 0.02 dwt. (2 cents) per ton of the original cyanide solution a very slight coloration will be perceived in the liquid; 0.03 shows a slight yellow; 0.04 slight pinkish-yellow; 0.06 strong pink; 0.08 the purple of Cassius."

Details of the method as employed at the Homestake are as follows:

Reagents required. Zinc dust, sifted through 200-mesh sieve.

Hydrochloric acid, concentrated C. P.

Nitric acid, C. P., 1 acid; 2 water, in dropping bottle.  
Lead nitrate, saturated solution, in dropping bottle.  
Sodium cyanide, saturated solution.

Tin chloride, about 12.5 per cent crystals + 10 per cent. concentrated hydrochloric acid.

Place about 500 cc of the sample to be tested in a light-colored sample bottle having a very slight shoulder; a quart beer bottle is about the right size. Add a measured quantity, 10 to 15 cc, of saturated sodium cyanide solution; two or three drops of saturated lead nitrate solution; and from 1 to 2 grams of zinc dust. One gram of the dust usually will be found sufficient. Stopper the bottle with the thumb and shake violently for at least two minutes, or until the precipitate is completely coagulated and will settle rapidly.

Invert the bottle over a casserole and allow the precipitate to settle. Remove the bottle and decant the clear solution from the casserole. Add hydrochloric acid to the precipitate, drop by drop, until the reaction ceases, and then add a few drops in excess. Add three to five drops dilute nitric acid, heat and evaporate to a volume of 1 or 2 cc. Transfer the solution to a small ( $\frac{1}{2}$ -in.) test tube, cool, and add about 1 cc tin chloride. A purple color indicates gold.

With low-grade solutions the tube should be allowed to stand a minute or two to bring out the full color. Faint colors may be seen better by looking down the tube. Some variations in the amount of cyanide, zinc dust or lead nitrate may be necessary with different solutions. The lead should be kept down as far as possible, using the minimum that will give a precipitate that settles rapidly, as this will require a minimum of nitric acid. Too much nitric acid may interfere with the production of the final color. Mercury also gives a dark coloration, and somewhat affects the color given by gold.—Metallurgical and Chemical Engineering.

#### ELECTRIC POWER FROM ANTHRACITE CULM.

A remarkable plant for generating electricity from unmarketable anthracite culm has been recently installed at Hauto, Pa., by the Lehigh Navigation and Electric Company. Two factors have previously hindered the utilization of this low-grade coal; its cost of transportation is the same as that for the higher grade of anthracite, and the large quantity of coal dust in the refuse renders a special furnace necessary for its proper combustion. The transportation difficulty can be overcome by turning the energy of the coal into electricity and transmitting the power by wire. The type of furnace to be used has received great attention from the designers of the Lehigh company's plant.

Grates for both hand and mechanical firing have been installed and their respective performances will be watched with interest. The combustion chambers are large and the air supply has been so arranged as to ensure a thorough burning of the fuel. The other features of the equipment, both for generating and transmitting the power, are modern and of a high standard. Evidently the men who are behind the project are confident that the proximity of a good market—Philadelphia and New York being within the radius of economical transmission—justifies the building of an expensive and up-to-date station, even though the fuel to be used is of a kind which is ordinarily wasted.

At Bankhead, Alberta, coal of a similar quality occurs. Huge dumps of this unmarketable material are to be seen near the mines, but the market for electricity in the vicinity is, unfortunately, limited. However, a certain amount of this culm is being used for making briquettes, although there is more of it than can at present be profitably utilized even in this way.



# CAUSES AND PREVENTION OF TUNNEL ACCIDENTS\*

By D. W. Brunton and J. A. Davis.

Data collected by the U. S. Bureau of Mines show that an average of nearly four men for each 1,000 employed in and about the metal mines of the United States were killed during the year 1911, as compared with 3.8 per 1,000 in coal mining during the same period. Although complete figures for accidents in tunnel driving can not be obtained, a study of such data as could be collected indicates that the number of deaths per year per 1,000 men employed has been somewhat greater than the above figures, the result obtained by averaging data extending over periods of 1 to 10 years for 16 representative tunnels being 4.7 deaths per year per 1,000 men employed. In addition to the men killed outright by accidents in tunnel work, nearly three times as many more have been seriously injured or perhaps maimed for life, and almost thirteen times as many slightly injured. By far the largest part of these deaths and injuries was caused by falling ore or rock from the roof or walls of the tunnels, but explosives, haulage, electricity, and other causes have each contributed their quota of casualties.

Are these accidents preventable? Not entirely, because some elements of danger are inherent in the work of driving tunnels; such, for example, as the danger from some unforeseen falls of roof, from the derailment of tunnel cars, or the risk involved in handling even the least dangerous explosives by the most approved methods. But it is equally true that much of the present mortality and injury is the result of ignorance or gross carelessness, and can be avoided. When, for instance, a man sees fit to thaw frozen dynamite in a frying pan or by a candle flame, there is nothing accidental about the explosion that ensues, except, possibly, the fact that a man so ignorant or reckless should have been intrusted with so dangerous a substance. Nor is the responsibility for accidents all on the part of the miner. The manager and his representatives are in many cases either ignorant of the precautions that should be taken for the safety of the men or most negligent in seeing that they are properly and consistently carried out. The following discussion of causes of tunnel accidents is presented in the hope that, by bringing these matters once more squarely to the attention of the men interested, much of the needless death and suffering may be prevented.

## Causes of Accidents.

**Falls of Roof.**—There are many causes that combine to make falls of rock from the roof by far the greatest source of danger in tunnel work, but perhaps the chief of these is the common practice of greatly overloading the holes with explosives. Extremely heavy charges shatter and crack rock that would ordinarily stand without any danger of falling, and render it extremely dangerous to the men working underneath. Of course it is essential to efficient work in tunnel driving that the blast should completely "break bottom" without any necessity for a second loading and firing; still every foreman and superintendent should see that the smallest amount of dynamite that will do the required work is employed in the holes near the roof. Economy of explosive demands this, all other considerations aside; but the dangers, also, of the heavier charges should be thoroughly appreciated by the superintendent

and, when such charges seem imperative, extra vigilance should be exercised and extra precautions taken for the safety of the men.

Another prolific source of accident is the fact that men sometimes return to the tunnel face, after shooting a round, without thoroughly testing the roof just exposed by the blast. It should be the duty of every man employed in the tunnel to examine the roof under which he must work, and especially in that part of the tunnel newly exposed after shooting; the foreman, upon reaching the heading after the blast, should at once detail one or two men (or as many as prove necessary) to clean down thoroughly all the loose pieces of overhead rock. Fortunately, this is done regularly at all well-organized tunnels and it is a practice that can not be too highly recommended for universal adoption.

It must be admitted that from a roof declared by experienced men to be sound, a large block may suddenly and without warning crash into the tunnel. This occurrence will undoubtedly be claimed to have been purely accidental; yet even the danger from such a block (which perhaps was perfectly solid when first exposed, but became loosened by the concussion of subsequent blasting) is, in many cases, overlooked because of the lack of illumination in which all tunnel work must be done, and may be discovered in time if there is a systematic and regular examination of the entire roof of the tunnel. Some one has pointedly observed, "The fall of a slab of rock weighing anything less than one ton should at once be charged to carelessness."

It should be said in this connection that the "sound" of the roof is not a proper criterion of its safety, because there are numerous cases on record where the sound of the roof was satisfactory and indicated rock that seemed solid even to experienced men, although a big block or boulder was actually loose. The better method of testing the roof—one used by many large mining companies and recommended by the Bureau of Mines—is to strike it with a pick or a heavy stick, at the same time touching the doubtful pieces with the free hand. If any vibration is felt the rock is unsafe and should be taken down or supported at once. If the roof is too high to reach with the hand, a stick should be held against the doubtful piece while it is being struck, and if it is loose the vibration can be felt through the stick.

Prompt and adequate timbering is extremely important. But timbering is a laborious process and it either takes the men of the tunnel crew from their regular work, or it requires extra men. Extra men, however, add to the confusion in the heading and, as their work is done simultaneously with the other work of the tunnel, it seriously hinders either the drillers or the shovelers, or both. So it has become recognized among tunnel men that in most cases timbering seriously impedes the progress of driving, and therefore, although it may be well understood that the roof is dangerous, there is almost always a tendency on the part of those responsible to delay timbering as long as possible. Perhaps the American willingness to "take a chance"—a trait particularly noticeable in the Western States—may be a contributing cause; but the fact remains

\*Extract from bulletin 57, published by the U. S. Bureau of Mines.



that the work of timbering is too often delayed until a so-called "accident" brings the necessity forcibly and unavoidably to the front. It is impossible to urge too strongly that all necessary timbering be done promptly, that it can not be done too soon, and that any delay seriously jeopardizes the lives and limbs of the men who have to work under a roof improperly supported.

It is true that in many tunnels the weight of the roof or pressure against the walls has been too great even for the strongest and heaviest timbering, and although such breakage can not always be prevented, it may often be alleviated by means discussed in the section on timbering. The important consideration in these cases as regards safety is the fact that actual failure of the timbers and caving of supported ground rarely comes without warning. Either the timbers will at least be bent appreciably before they break, or, as is usually the case, they will crack and splinter and so give unmistakable warning to the miner that the time is approaching when they will collapse. With such warning any subsequent accident is chargeable to carelessness or negligence in heeding the danger signal. It may be said in this connection that, other things being equal, timber that has a fiber that will split, crack, or splinter out, rather than that which has a fiber that will break off short under a transverse strain, is on this account more desirable for such work.

Falls of rock also caused by cars becoming derailed and knocking out the supporting timbers under a heavy or loose part of the roof, allowing the roof to fall and kill or injure any men who happen to be underneath. Such accidents are in many cases unavoidable because of the difficulty of preventing derailments. Owing to the lack of illumination, it is usually impossible to see whether the track ahead is clear, and it is therefore necessary to run somewhat blindly and assume that nothing has fallen upon the track since the previous trip; and the mere work of keeping the roadbed of a tunnel track in such shape that its unevenness would no longer cause the cars to jump off would be enormous. The only way, therefore, to lessen these accidents (which fortunately are not so numerous as from other causes) is to keep the track in as good condition as possible, and to use all reasonable watchfulness and caution in tramping, and to avoid in particular running trips at a high speed over bad track.

#### Use of Explosives.

Next in importance as a cause of injury in tunnel work is the careless, reckless, improper, or ignorant use (or rather misuse) of explosives. Such accidents are of various kinds, the most frequent being those arising from handling, storing, and thawing dynamite, from premature blasts, from misfires, or from poisoning by gases from explosives. The subject of the proper ways to handle, store, and thaw dynamite is treated at some length in the chapter on blasting, but as it is impossible to place too much emphasis upon the necessity for care and caution in the use of explosives, a recital here of the precautions to be taken is well warranted.

#### Precautions as to Handling.

Don't forget the nature of explosives, but remember that with proper care they can be handled with comparative safety.

Don't smoke while handling explosives and don't handle explosives near an open light.

Don't shoot into explosives with a rifle or pistol, either in or out of a magazine.

Don't attempt to manufacture any kind of an explosive except under the supervision and direction of a trustworthy person who is skilled in the art. Many serious accidents, which have destroyed lives or inflicted injury on persons and property, have been caused by such attempts.

Don't carry blasting caps or electric detonators in the clothing.

Don't tap or otherwise investigate a blasting cap or electric detonator.

Don't attempt to take blasting caps from the box by inserting a wire, nail, or other sharp instrument.

Don't try to withdraw the wires from an electric detonator.

#### Precautions as to Storing.

Don't leave explosives in a wet or damp place. They should be kept in a suitable, dry place, under lock and key, and where children or irresponsible persons can not get at them.

Don't store dynamite so that the cartridges are on end, as this position increases the danger of nitro-glycerin leaking.

Don't store or handle explosives near a residence.

Don't open packages of explosives in a magazine.

Don't open dynamite boxes with a nail puller, or powder cans with a pickax.

Don't store or transport detonators and explosives together.

Don't keep electric detonators, blasting machines, or blasting caps in a damp place.

Don't allow priming (the placing of a blasting cap or electric detonator in dynamite) to be done in a thawing house or magazine.

#### Precautions as to Thawing.

Don't use frozen or chilled explosives. Most dynamite freezes at a temperature between 45 and 50 deg. F.

Don't thaw dynamite on heated stoves, rocks, sand, bricks or metal, or in an oven, and don't thaw dynamite in front of, near, or over a steam boiler or fire of any kind.

Don't take dynamite into or near a blacksmith shop or near a forge.

Don't put dynamite on shelves or anything else directly over steam or hot-water pipes, or other heated metal surface.

Don't cut or break a dynamite cartridge while it is frozen, and don't rub a cartridge of dynamite in the hands to complete thawing.

Don't heat a thawing house with pipes containing steam under pressure.

Don't place a "hot-water thawer" over a fire, and never put dynamite directly into hot water or allow it to come in contact with steam.

#### Loading Precautions.

Don't allow thawed dynamite to remain exposed to low temperature before using it. If it freezes before it is used, it must be thawed again.

Don't fasten a blasting cap to the fuse with the teeth or flatten the cap with a knife; use a cap crimper. The ordinary cap contains enough fulminate of mercury to blow a man's head or hand to pieces.

Don't "lace" fuse through dynamite cartridges. This practice is frequently responsible for the burning of the charge.



Don't explode a charge to chamber a hole and then immediately reload it, as the bore hole will be hot and the second charge may explode prematurely.

Don't force a primer into a bore hole.

Don't do tamping with iron or steel bars or tools. Use only a wooden tamping stick with no metal parts.

Don't handle fuse carelessly in cold weather, for when it is cold it is stiff and breaks easily.

Don't cut the fuse short to save time. Such economy is dangerous.

Don't worry along with old broken leading wire or connecting wire. A new supply will not cost much and will pay for itself many times over.

#### Firing Precautions.

Don't explode a charge before every one is well beyond the danger line and protected from flying debris. Protect the supply of explosives from the flying pieces.

Don't hurry in seeking an explanation for the failure of a charge to explode.

Don't drill, bore, or pick out a charge that has failed to explode. Drill and charge another hole at least 2 feet from the missed one.

#### Premature Explosions.

It is often difficult to determine just what were the causes of premature explosion, because the persons responsible for the explosion rarely survive to tell the tale and even eyewitnesses are scarce; but carelessness in handling the dynamite in the heading is no doubt the most potent factor. In many cases the so-called accident does not result from the first instance of carelessness or recklessness, but is the disastrous climax of a series of practices that have become habitual; hence persons knowing the common disregard for dynamite on the part of the men who handled it and were killed are able to draw accurate conclusions as to the probable cause of the "accident." As an example might be cited the case of two men who were accustomed to throw sticks of dynamite to each other along the tunnel, over distances of 15 or 20 feet, especially if visitors with "nerves" were present. But even at other times, perhaps because of long familiarity with dynamite and hence a contempt or disregard of its true dangerousness, the sticks were thrown to one another rather than carried the few intervening feet. However, the practice as far as these two personally were concerned, was finally stopped by a disastrous explosion in which they were blown almost to atoms. The subsequent appearance of the tunnel indicated that the explosion was caused by the detonation of a stick falling near the full supply for the entire round.

Another cause of premature explosions is the practice of carrying dynamite to the face of the tunnel in a box or sack and dropping it rather roughly to the ground at the end of the journey. This contempt is also bred, no doubt, by familiarity. It is true that often times gelatin dynamite is not as sensitive to direct shocks as one might imagine, and that many times it will stand very rough usage without detonation; but in other cases, and there are very many of them on record, serious explosions have ensued as a result of inexcusable carelessness in handling. It is neither safe nor advisable to rely in any degree whatsoever upon the "inertness" of dynamite. Nor is it possible to condemn too strongly the practice of carrying detonators or primers (sticks of dynamite containing a detonator and a fuse) in the same bundle with the rest of a supply of explosive for a round. The detonators should always be brought in separately and

should under no circumstances be placed in the same box or even near together in the heading. Many serious accidents have resulted through disregard of this rule.

A certain risk must always attend the loading of a bore hole with dynamite, especially during the insertion of the primer, but much of the danger that often needlessly accompanies this work can be minimized or avoided by proper care. Efficiency of course demands that there shall be no air spaces in the charge of explosive when it is finally ready for detonation; hence the dynamite must be rammed down so that it fills all the unequal spaces in the bore hole; but tamping should always be done by pressure rather than impact. Never use a tamping bar as if it were a javelin. But even in pressing down the charge, great care must be taken that too much force is not employed, especially if a cartridge seems to stick in a hole; for should it become suddenly loosened the miner might not be able to recover himself in time to prevent its being rammed hard against the bottom with disastrous results. Anything more than light pressure should never be given the primer and under no circumstances should it or the succeeding cartridge be struck a blow with the rod.

Irregularity in the rate at which fuse burns is also a cause of premature explosions. Different makes and brands of fuse burn at different rates, and a miner accustomed to a slow-burning fuse will perhaps not realize the necessity of cutting the faster fuse longer, so that he may have time enough to reach a place of safety before the detonation takes place. There are several causes of variations in the burning rate even of the same brand of fuse. For example, experiments conducted by the Bureau of Mines show that mere confinement in a closed vessel is sufficient to cause a fuse to burn three or four times faster than its normal rate. It is true that under ordinary conditions of mining, variations of this magnitude are not apt to be reached, but irregularities of 20 or even 30 per cent. are quite possible and in long bore holes in which a quantity of tamping is used, especially of a type impervious to the escape of gases (such as closely packed wet clay), the variation may be much greater. Therefore, with such tamping, the rate of burning may be increased to a dangerous extent, unless due allowance be made for the extra speed. But even more important is the effect produced by mechanical injury, which is more apt to be a common occurrence. Mere bending of fuse (if it is in proper condition for use), such as might result from coiling it near the collar of the hole to prevent its being struck by flying rock from other blasts, or even placing it with some force within the hole, has little if any effect upon the rate of burning; but abrasion, blows, or too great pressure produces serious variations in this rate and in some cases may even cause fuse to burn almost instantaneously. It is therefore essential that none but fuse in good condition ever be brought into the heading, and that care be taken while it is there to see that it is not injured by rocks or tools falling on it, and that it is not abstracted or otherwise injured with the tamping bar while the hole is being loaded.

Mention should be made of the seemingly obvious danger of reloading a bore hole before it has had time to cool off sufficiently from a previous blast. In tunnel work this danger occurs in connection with the "guns"—the ends of holes that have not broken to the bottom with the first explosion.



### Misfires.

Many deaths and injuries are caused by the subsequent detonation of a charge of dynamite that failed to explode at the proper time. Such misfires do not, however, cause accidents unless the charge is detonated unexpectedly. Sometimes this happens by drilling into it during preparations for the next round, or by striking it in the muck pile, where it has been thrown by the blast from a neighboring hole, or perhaps by the sudden explosion of a delayed shot from a fuse that has long been smouldering.

Many misfires can be traced directly to some injury to the fuse. The insertion of the primer into the hole, fuse end first, often causes fuse to crack at the sharp bend thus made; the danger of such cracking is especially great when the fuse is cold or the hole is full of cold water. Sudden and rough uncoiling of the fuse in cold weather will usually cause it to break. Obviously, therefore, cold fuse should not be bent, twisted, or roughly handled. It is claimed by some persons that misfires are caused through fuse being cut off ahead of the fire by the explosion of a neighboring hole, so that the charge fails to explode. There is some question whether this really happens or not; but, if it does, it is a pretty strong argument that the hole was misplaced, for if a hole is properly placed, only in rare instances, if ever, will enough of it be shot away to cut off the fuse ahead of the fire. It is also claimed, and with somewhat more reason, that the fuse is apt to be torn out by flying pieces of rock from the explosion of other holes, but this result can be largely obviated if the fuse is properly coiled close to the mouth of the hole before it is "spit."

The failure of a fuse properly to ignite a detonator is often the result of improper storage. When the asphalt waterproofing composition used in some fuses gets too hot it becomes viscid and agglomerates the powder grains in the core of the fuse and thus delays, and in some cases actually prevents, the fuse from burning. Experiments conducted by the Bureau of Mines indicate that prolonged exposure at a temperature of 60° C. is sufficient to cause a marked retardation in the rate of burning of fuse. It follows, therefore, that fuse should not be stored near boilers, steam pipes, or other sources of heat, where the temperature is apt to be high. Cold is likewise deleterious, for it renders the asphalt composition brittle and liable to crack, and these cracks either decrease the rate of burning by permitting the gas from the powder core to escape more readily than usual, or, if they are large enough, they may stop the travel of the fire entirely. The fuse should be carefully protected from moisture during storage for, with waterproof fuse of the type almost universally employed in tunneling, if the dampness once gets into the powder train its removal is difficult. As the fuse burns, the moisture is driven ahead of the fire in the form of steam and even if it does not accumulate in sufficient quantity to quench the fire in the fuse, enough of it may be driven into the detonator to prevent ignition and thus cause a misfire.

Many misfires originate from improperly prepared primers. Before the fuse is inserted into the detonator, an inch or two should be cut off and thrown away, for gunpowder (which forms the core of the fuse) is somewhat hygroscopic, and the end of the fuse may have gathered moisture enough to quench the burning powder or prevent the ignition of the cap. This cut should be made with a sharp-cutting tool,

squarely across the fuse, for if made diagonally the point may curl over the end of the fuse when inserted in the detonator and thus prevent the spit of the powder train from reaching the detonating composition in the cap. Care should also be taken that the powder grains in the end of the fuse do not leak out after the fuse has been cut, for this would tend to weaken the force of the spit into the detonator and might prevent its ignition. The open end of the cap should be carefully crimped around the fuse with a proper crimping tool, so that it will be tight enough to hold the detonator and the fuse together and keep out moisture, but the crimping should not be tight enough to cut off the powder train in the fuse. This is particularly liable to happen with a narrow crimping tool that presses a narrow groove in the detonator and the underlying fuse. There are tools on the market that have a crimping face of at least a quarter of an inch, and the extra price of these tools would be no more than the cost of the explosive wasted by a single misfire—to say nothing of the loss of life that might arise therefrom. It is, of course, obvious that the teeth or knife should never be used for crimping, for, as previously stated, there is enough explosive in an ordinary detonator to blow a man's head or hand to pieces. After it is crimped, the detonator should be buried in the end of the stick of dynamite, with its axis parallel to that of the stick, and the top of the detonator should be flush with the top of the dynamite. For if the cap is buried deeper, the explosive is liable to become ignited from the side spitting of the fuse before it is properly exploded by the detonator, a result that not only destroys the efficiency of the explosive, but causes a larger amount of gases, especially those most dangerous to the men who must breathe them. It is also important to use a detonator of sufficient strength. Although 3X blasting caps were considered strong enough for "straight" nitroglycerin dynamite, the less sensitive gelatin dynamite requires a much stronger detonator to explode it properly. For this reason nothing weaker than .5X caps should ever be used with gelatin dynamite, and the universal experience is that better results have been obtained when a change has been made to even stronger detonators. These insure the complete detonation of the explosive and thus produce only a minimum amount of dangerous gases.

It is very difficult to count the explosions during blasting and be sure that the charges have all been detonated, so it is not always possible to determine whether there has been a misfire. For this reason the face, or as much of it as is not covered by the debris resulting from the blast, should be inspected for evidences of missed holes, and it should be carefully watched during the removal of the muck. If a missed hole is discovered, under no circumstances should an attempt be made to pick out the material. If no tamping has been used, a stick of dynamite containing a detonator should be inserted in the hole and exploded. If tamping has been employed, another hole should be drilled and blasted at least two feet from the missed one. In picking down the muck pile the pick should be handled as if it were a hoe and not like a sledge hammer; that is, the material should be pulled or scraped down and never struck violently with the point of the pick. In this way, should there happen to be a piece of unexploded dynamite in the debris, there is much less danger of its exploding. The importance of this precaution can not be too strongly



emphasized. Should a piece of dynamite be discovered in the muck, it should be removed carefully and handed to the foreman who should at once take it to a safe place, and extreme care should be used if a piece of fuse accompanies it or is discovered near it, for this would indicate that an unexploded detonator may possibly still be inside of the stick of dynamite, the danger of which is obvious. Under no circumstances should a new hole be started in the remnants of a hole that has ever held dynamite; for although the inference is always, of course, that the dynamite has been detonated, still there remains a chance that detonation has not occurred—a chance not as slight as ordinarily might be supposed, to judge from the number of accidents traceable to this source. And even if a rod be used to test the hole, it might encounter a small obstruction thus seeming to show the bottom of the hole and fail to reveal the dynamite beneath.

#### Gases From Explosives.

Poisoning from the gases produced by explosives is common in tunnel work. The ailment is familiar to most miners; in its mild form it is usually called "powder headache" and produces little more than temporary inconvenience, but in severe cases it has been known to produce death within a very short time. In the section on blasting it is explained that the harmful gases resulting from the complete detonation of dynamite under normal conditions are usually carbon dioxide and carbon monoxide; that although carbon dioxide will not support respiration, and when present in sufficient quantities may cause unconsciousness and even death, it has no very injurious effects when sufficiently diluted; that carbon monoxide is exceedingly dangerous and even small amounts of it may prove fatal if breathed for a sufficient length of time. This gas probably causes the familiar symptoms after a dose of "powder smoke." By reference to the table on page 153, it will be seen that gelatin dynamite, the explosive almost universally used in tunnel work, under proper conditions generates comparatively little of the more dangerous gas. Experiments conducted by the Bureau of Mines indicate that even this can be obviated by a slight modification in the chemical composition of the gelatin dynamite. But when even such a dynamite is not completely detonated (either through the use of too weak a detonator or any other cause), and especially when it burns rather than explodes, a much greater volume of monoxide is formed, and in addition there are a number of other harmful gases developed, including the dangerous peroxide of nitrogen. It is therefore essential that the detonators employed be strong enough to explode the dynamite completely, and that every precaution be taken to prevent the dynamite from taking fire through the side spitting of the fuse or in any other manner.

The deadliness of the gases resulting from explosives improperly detonated may be illustrated by describing an accident that is known to have cost 9 lives. A study of the attendant circumstances, as described to the writers, indicates that the explosive, or at least a large part of it, must have burned rather than detonated. Gelatin dynamite was employed and the charge was even smaller than previous blasts of which the men had inhaled the fumes without serious effects, but in this case the fumes are described by the men as being brownish yellow rather than the usual grayish or bluish white. After igniting the blast the men retired about 500 feet to wait for the smoke to clear, and while they were waiting the smoke drift-

ed slowly over them and then, owing to some change in the current, drifted slowly back again. The men soon felt the usual symptoms of carbon monoxide poisoning—slight choking, nausea, profuse perspiration, and headache—but they all revived upon reaching the open air about an hour and a half after the blast was fired. Within a short time, however (and in one case before the man could walk to the bunk house), the men began to cough up bloody mucus and to exhibit other symptoms of nitrogen peroxide poisoning, and in less than three days 9 of the 13 men who had been in the tunnel and exposed to the fumes had died. The 4 who escaped were either not exposed to the gas for the full time, or else found some other source of air supply which served partly to dilute the gases; but some of these men as well as those who went in with the motor to bring the men out were ill for days and even months after the catastrophe.

It is the opinion of physicians who have studied the matter that many swift deaths among miners, formerly diagnosed as pneumonia, may really have been caused by the inhalation of gases from burning dynamite.

#### Gases From Other Sources.

Although any carbon monoxide encountered in tunnel work is liable to be a result of the use of the dynamite, there have been cases where this dangerous gas has been generated by the combustion of oil and grease in the air receiver and transmitted to the heading by the compressed-air pipe. The causes of such combustion are fully discussed in the section on air compressors, but mention is here made that the ignition of accumulated oil and grease is generally due to faulty valves in the compressor. These permit warm compressed air to leak back into the cylinder; this air upon being recompressed becomes still hotter, so that after a time the temperature of the air in the receiver may be far higher than the ignition point of the lubricant employed. If an explosion does not then ensue, the oil on the sides and bottom of the receiver will burn and produce carbon dioxide or carbon monoxide, either of which jeopardizes the safety of the miner in the heading. It is therefore necessary to inspect the valves of the compressor regularly; moreover, dependence should never be placed on the compressed-air line for tunnel ventilation.

There are several tunnels in which bodies of gas have been encountered, the gases most frequently found being carbon dioxide and hydrocarbon gases. The former is, of course, chiefly dangerous because of the possibility of men being suffocated, but this can be largely obviated by proper ventilation. In one of the tunnels of the Los Angeles aqueduct, flows of carbon dioxide were encountered in a series of crevices across a zone about 150 feet wide. In order to make it possible for the men to work in the tunnel this zone including 300 feet on either side, was tightly sealed with concrete; in addition it was found necessary to leave in the center of the gas zone back of the concrete an annular space to which an exhaust "blower" was connected that constantly drew off the gas during the driving of the tunnel, while an additional blower forced fresh air in to the men. If either of these machines stopped the men had to get out of the tunnel as fast as possible, but as long as the machines kept running the air was sufficiently pure.

The chief danger from hydrocarbon gases lies in their explosibility, but they are so commonly encountered in coal mining that precautions to be taken in their presence are fairly well known. However, a rather unique although highly dangerous method of



dealing with them was employed in one of the tunnels examined by the writers, and is well worth describing.

The gas was encountered in a zone approximately 2,300 feet in extent, through about 500 feet of which oil could be distilled from the rocks, although there was no seepage. The gas was highly explosive, and had an odor of kerosene or gasoline rather than of crude petroleum. The largest quantities of it came into the tunnel immediately after blasting, and the maximum accumulation was approximately 30,000 cu. ft. There did not appear to have been any particular seepages in the gaseous zone, but rather there was always an unknown quantity ahead of the work. As the gas was highly explosive extra precautions had to be taken for the safety of the men at work. The mere requirement of safety lamps in the tunnel was not considered sufficient, because the very nature of the rock was such as to cause dangerous sparks from a pick or from the starting of a drill hole, which it was thought would be sufficient to ignite the gas and produce an explosion. The expedient adopted was to explode the accumulation after each blast and to burn any new gas as fast as it appeared in the tunnel during the remainder of the work.

For this purpose the tunnel was wired from the portal to the heading with a 550-volt circuit, into which there were introduced at intervals of about 200 ft. throughout the entire gas-bearing section a number of arcing devices. Any ordinary street arc lamp could have been adapted for this work, provided that the carbons were not exposed for more than 2 in.; otherwise the concussion from ordinary blasting, as well as from the gas explosions, would have broken them. The use of one soft and one hard carbon was found to give the best results. The system was operated as follows:

Immediately after blasting, a fire boss and his helper took charge of the tunnel. After waiting 30 minutes after the blast had been fired they turned a current of electricity through the arc line by means of a switch at the portal. The arcs were purposely placed in series in order to make certain that if any one of them burned they would all burn; an ammeter was placed at the control switch to show whether they had lighted. If the arcs did light, an explosion generally ensued, sometimes a severe one. But whether or not there was an explosion the switch was always opened for 15 minutes and then closed a second time as an added precaution, although a second explosion never resulted. When the line was dead once more two men carrying safety lamps proceeded to a protected station approximately halfway to the heading, where they again sent a current through the arcs. A few explosions resulted from this practice, but they were unusual rather than customary. After having made this test the fire boss and his helper proceeded to the heading, testing the entire tunnel for gas by means of the safety lamps they carried. They would ordinarily find in the heading an accumulation of gas extending back a distance of 125 to 150 feet, because the nearest arc could not be placed much nearer to the heading than 150 feet on account of the danger of the carbons being broken by the concussion from the blasting. The fire boss would then take an arc kept 150 feet from the face and attached to the circuit by an armored cable and place it over the muck pile; the two men would return again to the midway station and once more close the circuit and ignite the remaining gas. Then, and then only, with all the arcs burning, they would return to the heading and place torches as near the roof as possible at intervals of about 150 feet throughout the gaseous section. The torches were lighted from the arcs, and the men

were not permitted to light them in any other way, or, indeed, to carry into the tunnel any other means of lighting them. By this time all the seepages that were strong enough to support a steady flame would have been lighted and would be burning, and the gas that came from pockets that could not sustain a flame would be ignited by the torches before it could accumulate in any quantity.

The fire crew then returned to the mid-station, where they extinguished a red light and lighted a white one, indicating that the tunnel was safe for the incoming crew, for no one but these two men were allowed in the tunnel beyond this point unless the red light was out and a particular white one burning, in order to obviate danger through any accidental extinguishing of the red light without the knowledge of the fire crew and before the tunnel was safe. The fire crew was allowed four hours for this work, although ordinarily that length of time was not required.

The working crew upon reaching the heading ordinarily found the muck pile too hot to be handled, if, indeed, it was not actually in flames, for it burned usually for one-half to two hours after each blast, and once at least it burned for 14 hours. After it had been cooled sufficiently by streams of both air and water, the machines were set up and the round of holes drilled in the regular manner. Any gas that developed during the drilling of a hole was lighted as soon as the hole had been completed, and if sufficiently strong to support a flame it would burn until the end of the shift. At one time as many as 6 out of 8 holes on the top round were burning like blow-torches, giving flames 6 to 18 inches in length. When the round had been finished the holes had to be cooled before loading. This was accomplished by turning water and air lines through ordinary blowpipes, both into the holes and over the face of the tunnel. The flames were, of course, extinguished by this process, and as soon as the gas had accumulated in the tunnel sufficiently to become apparent in a safety lamp placed near the roof about 30 feet from the heading, it was ignited by a torch and the resulting flames were at once put out again by air and water. This process was continued until the holes were cool, when they were at once loaded as rapidly as possible and fired, the fuses being always lighted from near the bottom of the tunnel.

Although the fact that there were no accidents in driving through the gas-bearing zone after the installation of the "safety arcs" shows that this system was efficacious in this particular instance, it is not one that can be recommended unqualifiedly for general use. In the opinion of engineers who have made a special study of the question of safety in mining, the use of anything but safety lamps or their equivalent in mines or tunnels where explosive gases are known to exist is never without risk, whereas the practice of burning the gases as fast as they make their appearance is in itself extremely hazardous. Indeed, the fact that no disastrous explosion occurred under this system seemed to them remarkable. Moreover, it is obvious that long delays were necessary before the men could start to work, and even after they had reached the heading the heat must have greatly decreased their possible efficiency. A less dangerous method of handling the gas, and one that would probably prove more economical in the end, would be the installation of a ventilating system large enough to dilute to harmlessness several times the amount of gases ordinarily encountered. Safety lamps only should be allowed in the tunnel and all blasts should be fired by electricity.

(To be continued)



# ANNUAL REPORT OF THE MINISTER OF MINES FOR BRITISH COLUMBIA

The Annual Report of the Minister of Mines for British Columbia for the year 1913 has just been issued by the Department of Mines, Victoria, B.C. It has been prepared by the Provincial Mineralogist, Mr. Wm. Fleet Robertson, and is of greater bulk, by nearly 100 pages, than was the report for 1912. It includes reports by the Provincial Mineralogist, his assistant, Mr. J. D. Galloway, and Messrs. W. M. Brewer and D. G. Forbes, who were engaged to examine and report on several mining districts in the province. In addition, information is quoted from reports of Messrs. C. H. Clapp and R. G. McConnell, of the Geological Survey of Canada. Much information also is contained in the official reports of the Chief Inspector of Mines, district gold commissioners, mining recorders, district mine inspectors, and others. The report is freely illustrated with numerous excellent half-tone reproductions of photographs, and with maps, diagrams, sketches, etc. A full index adds to the usefulness of the publication. The printing was done in the Provincial Government printing office, Victoria, and the work in both text and illustrations is creditable to printers and pressmen alike.

## Mineral Production.

The gross value of the mineral production for 1913 was \$30,296,398, as compared with \$32,449,800 for 1912. There was, therefore, a decrease in value of \$2,144,402 or about 6.6 per cent. Leaving out 1912, however, no other year's production reached so high a total value, the nearest having been \$26,377,066 in 1910. The smaller output of coal, due to labor troubles at Vancouver Island collieries, and that of copper, were the chief causes of the decrease; as compared with 1912, the decrease in value of coal and coke produced was \$1,589,352, and in copper \$1,314,024. Then there was less placer gold by \$45,500 recovered last year than in 1912.

The following comparative table gives the particulars—quantities and value—for the two years, 1912 and 1913, respectively:

	1912		1913	
	Quantity.	Value.	Quantity.	Value.
Gold, placer, oz...	.....	\$555,500	.....	\$510,000
Gold, lode, oz....	257,496	5,322,442	272,254	5,627,490
Total gold ....		\$5,877,942		\$6,137,490
Silver, oz. ....	3,132,108	1,810,045	3,465,856	1,968,606
Lead, lb. ....	44,871,454	1,805,627	55,364,677	2,175,832
Copper, lb. ....	51,456,537	8,408,513	46,460,305	7,094,489
Zinc, lb. ....	5,358,280	316,139	6,758,768	324,421
Total metalliferous .....		\$18,218,266		\$17,700,838
Coal, tons* ....	2,628,804	9,200,814	2,137,483	7,481,190
Coke, tons* ....	264,333	1,585,998	286,045	1,716,270
Building materials, etc. ....		3,435,722		3,398,100
Total value of production ..		\$32,440,800		\$30,296,398

\*2,240 lb.

It may be noted that the production of lode gold was the highest in the history of mining in the province, the largest output in previous years having been 267,701 oz., in 1910. Of the miscellaneous products, cement was highest, with a value of \$1,290,500.

The total value of the mineral production for all years to the end of 1913 is \$460,433,920, in the following proportions:

Gold, placer .....	\$ 72,704,603
Gold, lode .....	76,486,512

Total gold .....	\$149,191,115
Silver .....	35,832,546
Lead .....	29,696,585
Copper .....	80,818,051
Iron, zinc, platinum, etc. ....	1,852,824

Total metalliferous .....	\$297,391,121
Coal and coke .....	\$142,068,615
Building materials, etc. ....	20,974,184

Total non-metalliferous ...	\$163,042,799
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Total value of production . \$460,433,920

## Production by Divisions and Districts.

Cariboo—Cariboo mining division	\$131,000	
Quesnel mining division....	55,000	
Omineca mining division ...	40,024	
		\$ 226,024
Cassiar .....		412,748
East Kootenay .....		5,947,935
West Kootenay—		
Ainsworth mining division..	627,150	
Slocan and Slocan City div.	2,258,300	
Nelson mining division ....	863,966	
Trail Creek (Rossland) div..	3,306,771	
Other divisions .....	36,911	
		7,092,107
Boundary—		
Osoyoos, Grand Forks, Green-		
wood .....	6,833,902	
Similkameen, Nicola, Vernon	1,019,340	
Yale, Ashcroft, Kamloops...	72,094	
		7,925,336
Lillooet .....		71,445
Coast—Nanaimo, Alberni, Clayo-		
quot, Quatsino, Victoria, Van-		
couver .....		8,620,803

Total. . . . . \$30,296,398

An analysis of the production of the several districts shows the proportions of the several classes of minerals to be as under:—

	Metalliferous.	Non-metalliferous.	Coal and Coke.
Cariboo .....	\$ 201,024	\$ 25,000	
Cassiar .....	259,748	53,000	
East Kootenay ...	1,036,597	50,500	\$4,860,838
West Kootenay ...	7,012,407	79,700	
Boundary .....	6,700,439	295,500	929,397
Lillooet .....	31,445	40,000	
Coast .....	2,359,178	2,854,400	3,407,225

Totals. . . . . \$17,700,838 \$3,398,100 \$9,197,460

In Cariboo and Quesnel divisions of Cariboo district production was chiefly of placer gold, these divisions having contributed \$161,000 of that metal. From Omineca division there was silver, lead, and placer gold, in that order, with relatively small amounts for lode gold and copper. Cassiar district produced \$328,000 in placer gold of which \$315,000 was from Atlin



division. Of the remaining production \$53,000 was for structural materials. East Kootenay produced more coal and coke than any other district in the province—to a value of \$4,860,838. The gross production of coal was 1,331,725 long tons, of which 433,277 tons was made into 286,045 tons of coke. There was an increase, as compared with 1912, of 70,513 tons in the gross output of coal. Of the metalliferous minerals produced, the greater part was of lead-silver ore from the Sullivan Group mines, near Marysville.

As may be seen, West Kootenay district produced more than \$7,000,000 in metals. In Ainsworth division, production was mainly of lead and silver. The chief products of Slovan district mines were silver \$1,045,816, lead \$890,096, and zinc \$317,188. Nelson division produced lode gold \$544,117, silver \$73,278, lead \$76,101, and copper \$124,470. From Rossland mines, in Trail Creek division, came lode gold \$2,831,873, silver \$62,244, and copper \$387,654. Practically all of the production from "other divisions" was from the Lardeau district, where silver-lead ore was the chief product.

Of the comparatively large total shown as the production of Boundary district—second only to the Coast district—nearly all of the \$6,700,439 for metals came from the big copper mines of the Granby Consolidated and B. C. Copper Co., in the neighborhood of Phoenix and Greenwood, and the Hedley Co's gold mine in the Similkameen country. The several proportions were copper \$4,376,313, gold \$2,098,238, silver \$224,081, and lead \$1,807; total \$6,700,439. The production of structural materials was fairly well distributed over this big district. Mines in Nicola valley produced most of the coal credited Boundary district in the foregoing table. Lillooet's metalliferous production was largely in lode gold.

In the Coast district, the large amount shown as the value of coal produced was contributed by Vancouver Island coal mines. Other non-metalliferous products were cement \$1,280,000, clay products \$636,900, building and other stone \$612,500, sand and gravel \$325,000. The value of the several metals produced was as follows: Copper \$2,205,567, gold \$95,255, and silver \$58,356.

As the Britannia mine in Vancouver mining division was by far the largest producer of ore containing copper and silver, it follows that a large proportion of these metals was from that mine. Texada Island mines came next, with gold, silver, and copper as their production.

As compared with 1912, both East and West Kootenay districts made an increase in total value of output of minerals, the former of \$224,931, and the latter of \$926,852. Ainsworth, Slovan, Nelson, and Rossland, all shared in the advance in West Kootenay. In Lillooet district, too, there was an increase of \$66,445. On the other hand, there were decreases in all other districts, to the extent of \$2,474,753 in Coast district, and \$791,070 in the Boundary, with a smaller falling off in value of production in Cariboo and Cassiar districts. However, the unfavorable conditions are believed to have been temporary, an improvement in 1914 being expected.

#### General Notes.

The total quantity of ore mined in the Province in 1913 was 2,663,809 tons, as against 2,688,532 tons in 1912—a decrease of 24,723 tons. There were 110 mines that shipped ore, and of these 58 each shipped more than 100 tons. Of 95 non-shipping mines only 28 were

worked. The corresponding figures for 1912 were 86 shipping mines of which 51 shipped more than 100 tons each, and 96 non-shipping mines, of which 45 were worked.

The number of men employed in the metalliferous mines was 4,278, of whom 2,773 worked below and 1,505 above ground. The figures for 1912 were: Worked below ground 2,473, above 1,364, total 3,837. There were 441 more men at work in these mines last year than in 1912.

At the coal mines, there were 6,671 hands employed (including 124 boys), as compared with 7,130 (221 boys) in 1912. Of these there were, in 1913, 5,828 whites, 837 Orientals, and 6 Indians; the proportion employed underground was 4,950, (of whom 409 were Orientals), and above ground 1,721. In 1912, of 5,275 employed underground, 323 were Orientals, while of 1,855 at work above ground 416 were Orientals. The gross production of coal in 1913, with 6,671 hands employed, was 2,570,760 long tons, as compared with 3,025,709 tons in 1912, with 7,130 employed.

The percentage of the several districts in regard to production of the 2,663,809 tons of ore mined in the Province in 1913 was as follows: Boundary, 69.30 per cent.; Rossland, 9.52 per cent.; Coast, 8.67 per cent.; Slovan, 4.35 per cent.; Ainsworth, 3.46 per cent.; Nelson, 2.99 per cent.; East Kootenay, 1.60 per cent.; all other parts, 0.11 per cent.

Approximately 73 per cent. of the lode gold produced in 1913 was obtained from smelting ores also copper-bearing; the remainder by stamp-milling. Silver came chiefly from Slovan district—about 67 per cent. of the whole—and about 10.5 per cent. from East Kootenay, all from argentiferous galena. Lead, like silver, came chiefly from Slovan-Ainsworth district—57.26 per cent. of the whole—and East Kootenay 37.94 per cent. Copper was obtained from Boundary mines 61.60 per cent., Coast mines 31.10 per cent., Rossland mines 5.46 per cent., and Nelson 1.76 per cent. The average assay returns in copper from ores of the several chief copper-producing districts are: Boundary 0.777 per cent., Coast 3.123 per cent., and Rossland 0.5 per cent. The whole of the zinc produced came from mines in Slovan-Ainsworth divisions.

#### Miscellaneous Minerals.

Concerning minerals other than those included in the tables of production, the Provincial Mineralogist remarks:

"**Iron Ore**—The situation in regard to iron ore remains unchanged, no material advancement having been made in the utilization of the numerous deposits throughout the Province. At present there is no market in British Columbia for iron ore, and, as a consequence, very little development work has been done. There are, undoubtedly, a number of iron ore deposits in different districts which are of considerable size, and which, as a rule, are very free from injurious elements. In considering the possibility of the successful establishment of an iron and steel industry, other factors beside availability of ore are important, namely, a sufficient market for the products, a supply of fuel nearby at a price comparable with what it is in the East, and a steady supply of suitable labor. So far as is at present known on the Coast, there is no developed body of hematite or other ore of iron, such as would be desirable to mix with the magnetites for blast-furnace smelting. In the Coast district the iron ores are all magnetites, as far as have been developed in any quantity, and, although these



sometimes contain sulphur, as pyrite, they are singularly free from other impurities. As to the electro-thermic smelting of such iron ores into commercial pig iron, the process has not as yet been sufficiently perfected, although it is looked upon as one of the possibilities of the future. Considerable interest has been manifested during the past year in regard to iron deposits generally, and there have been many rumors of intended installations of iron-smelting plants, but nothing at all definite has yet become public.

**"Platinum"**—No production of platinum in 1913 has been reported, and it is not likely the Tulameen district output was more than a few ounces. The Mines Branch of the Dominion Department of Mines, Ottawa, in October last, had one of its officers, Dr. Wilson, sample the dikes in the vicinity of Nelson, which it had been claimed contained platinum. He took some seventeen samples, and Dr. Haanel, the Director, now writes that, upon assay, none of the samples were found to contain any platinum or metals of the platinum group.

**"Diamonds"**—Nothing has been heard concerning diamonds in the Tulameen country, the earlier discovery by a geologist of the Geological Survey still remaining of purely scientific interest. Prospectors have been examining the gravels in the district for the precious stones, but, so far, have not found any of commercial value.

**"Oil"**—Drilling for oil was continued in the Fraser valley, and also in the neighborhood of Otard Bay, Graham island, but although the results are said to be encouraging, no appreciable flowage of oil has yet been reported. The British Columbia Oil and Coal Development Co. has put down three or four bores on Sage creek, in the Flathead country, Southeast Kootenay, and it is reported that in the last two holes, sufficient oil was encountered to induce the company to proceed at once to bore a big deep well.

**"Mica"**—A small amount of development work was carried out on the mica claims in the vicinity of Tete Jaune Cache, but no output has yet been recorded. Now that the Grand Trunk Pacific Railway has been built to within a few miles of these claims, it is pretty well assured that they will be seriously investigated during the coming season."

The report may be obtained gratis on application to the Minister of Mines, Victoria, B.C.

### SUPERVISION OF COAL MINING.

In Western Canada there are usually a number of coal seams quite close together, and, should the lower seams be the more desirable with regard to quality and ease of working, there is nothing to prevent the operator from mining them first. In fact, this practice is now being followed in a number of cases in the west. As a result, caving of the measures will render it difficult, and, in many cases, impossible, to recover the coal from the upper seams. Owing to the wide distribution of coal, and the granting of leases to any one desiring to mine it, the operator who looks to the future and mines the coal in a systematic manner, at an additional cost to himself, has to compete with the operator who takes the easiest available coal. There is, therefore, little encouragement to use other than wasteful methods. A case came under notice where, owing to a great demand for coal, the directors instructed a mine-manager to produce an output greater than the development work justified. The mine manager was forced, against his better judgment, to obtain the coal wherever he could. Some pillars were extracted and others were reduced to such

dimensions that they were not able to bear the weight of the superincumbent strata. As a consequence, there was a squeeze, and to-day the mine is badly wrecked and much coal has been lost. In this case, the opinion of an engineering authority would have stood between the mine-manager and the directors of the company.

It is suggested that an engineering authority be appointed by the Dominion Government to approve of the methods to be employed at all mines operated under a Dominion Government lease, and that the chief inspector of mines of each province be associated with the engineering authority in so far as matters relating to the operation of mines in that province are concerned. It would also be the duty of such authority to investigate all applications for leasing of coal lands and to determine the conditions under which such leases should be granted.

It is of interest to note, in this connection, that the Dominion Government exercises a stricter supervision over the leasing of water powers than that suggested with regard to coal; yet coal is just as important as water power, and, unlike it, can be exhausted.—From "Conservation of Coal in Canada," by W. J. Dick.

### SAFETY AND EFFICIENCY IN MINE TUNNELING.

A very interesting bulletin on this subject, prepared by David W. Brunton and John A. Davis, has been published by the United States Bureau of Mines.

The purpose of the report, as stated by the authors, is to present the results and conclusions obtained from investigations carried on during recent years by the U. S. Bureau of Mines, which undertook to make a special examination of safety in mining operations in connection with an investigation of mining methods and means for preventing accidents.

Emphasis is placed on safe, efficient, and economic methods and good points of equipment, whereas bad practice and obsolete machinery are ignored except when referred to as inadvisable, or as having some bearing historically. The aim has been to set for them a guide for future work rather than a mere record of present practice.

### TAR FORMING TEMPERATURES OF AMERICAN COALS.

The nature of the volatile matter in bituminous coal is attracting considerable attention at the present time. This is due not only to the enormous amount of coal annually used, but also to the important part volatile matter plays in determining how the coal must be handled in order to obtain the best results.

One of the most important and troublesome constituents of the volatile matter is tar, especially when the coal must be used in boiler furnaces or in power-gas producers.

Investigations discussed by O. C. Derby in a bulletin published by the University of Wisconsin, had in view: (1) the determination of the temperature limits between which tars are distilled from the various classes of coal; (2) the temperature limits of the maximum rate of evolution of tars; and (3) the relative quantities of tars distilled from various general classes of coal.

Briefly stated, the results show that with any coal, tars commence to distil at about 300 deg. C. and are completely distilled at 550 deg. to 600 deg. C. The greatest evolution of tar vapors occurs (on the average) between 375 deg. and 475 deg. C. The amount of tar produced depends not on the relative amount of volatile matter in the coal but upon the ratio of carbon to the hydrogen as shown by an ultimate analysis.



### OIL PUMPING IN CALIFORNIA.

According to Ralph Arnold and V. R. Garfias in a bulletin published by the U. S. Bureau of Mines, the majority of oil operators believe that the best means of increasing net production is to add to the number of producing wells, and although in many cases this plan may be advisable, in others it leads only to greater expenditure without proportionate return. The financial success of an oil enterprise frequently depends on the factors controlling the ratio between gross production and recoverable oil; that is, on the efficiency attained in the recovery of the oil from the underground reservoir. Efficiency of recovery will assume greater importance as the production of the fields decreases and as uses for crude petroleum are developed.

The pumping of oil under the conditions prevailing in California presents difficulties seldom encountered in mechanical problems of like nature. The character and extent of the difficulties will be evident in some measure if one realizes that a fluid having the consistency of molasses and carrying a large quantity of sand has at many wells to be lifted through a column of tubing 2 or 3 inches in diameter and half or three-quarters of a mile in depth.

The recovery of oil from shallow wells naturally may be effected by apparatus relatively cheaper and simpler than that required for deep wells, and in order to obtain uniformly successful results from different properties it is necessary that the extra cost of operating in deep territory be compensated by a correspondingly greater yield or better quality of oil.

In some of the fields of California wells 200 to 1,000 feet deep, producing about 5 barrels a day, can be operated at a profit if the selling price is as low as 30 cents a barrel, whereas in others, where the oil has to be lifted 3,000 to 4,000 feet, it is not economical to pump the wells unless the yield equals or exceeds 100 barrels a day, or unless the wells contain sufficient gas to assist materially the action of the pump. Some properties in the Santa Clara Valley district afford a striking example of high efficiency. The wells are drilled in 10 to 15 days, tapping the oil sand at about 700 feet; these are pumped in groups of about 20 by means of a pumping "power" operated by a gas engine using natural gas from the wells. The oil produced, owing to its quality, is sold at a price about three times that commanded by the heavy grades in California. The other extreme is well exemplified in the San Joaquin Valley fields, where small quantities of oil are being recovered after more than a year has been consumed in drilling to a depth of over 4,000 feet. Between these extremes the range in types of producing oil properties is great, and the line separating profitable from unprofitable investments fluctuates under the influence of the various factors affecting the industry.

One might conclude from the foregoing discussion that the only oil properties worth developing at the present time are those in which oil is encountered in commercial quantities at comparatively shallow depths but such an assumption is incorrect, as in many instances the increased cost of deep operations is more than compensated by greater thickness of the oil-sand strata, better quality of oil, stronger gas pressure, and the resultant large production and longer life of the wells. In the Coalinga field several wells over 4,000 feet deep, producing oil rated at 0.9210 to 0.8805 specific gravity (22 to 29 deg. B.), are being pumped at a good profit.

### FATAL ACCIDENTS IN BRITISH COLUMBIA MINES.

The statement of the coal and metal mine fatalities in British Columbia during the second quarter of the current calendar year has been issued by the Provincial Department of Mines. It has been compiled by the Chief Inspector of Mines, Mr. Thomas Graham. The following is a summary of this return:

#### Coal Mine Fatalities.

There was only one man killed in and about the coal mines of the Province during the second quarter of 1914, as against 12 during the corresponding period of 1913. The figures for the expired six months of this year are: Killed during January-June, 1914, 8; during the same months of 1913, 19, as under:

	1914.	1913.
January . . . . .	1	2
February . . . . .	4	1
March . . . . .	2	4
April . . . . .	1	9
May . . . . .	0	2
June . . . . .	0	1
Totals . . . . .	8	19

The collieries at which the fatalities occurred in 1914 were: At Hosmer colliery, Crow's Nest Pass, 3; at Crow's Nest Pass Coal Co.'s colliery, Michel, 1; at Canadian Collieries, Ltd.'s colliery, Cumberland, V.I., 3; at Western Fuel Co.'s colliery, Nanaimo, V.I., 1.

Six of the fatalities are placed under the heading, "Killed Underground," one under "Killed in Shaft," and one under "Killed on Surface." The causes of death underground were: By falls of roof and rock, 2; falls of coal, 1; mine-cars and haulage, 1; suffocation in fine coal, 2. That in the shaft was "by cage." That on the surface was "by coke-oven larry."

#### Metal Mine Fatalities.

There were nine men killed in and about the metal mines of the Province during the second quarter of this year as compared with four in the corresponding period of 1913. For the six months of the two years the numbers are 14 for this year, as against 7 for last year, as under:

	1914.	1913.
January . . . . .	1	1
February . . . . .	0	0
March . . . . .	4	2
April . . . . .	1	0
May . . . . .	3	1
June . . . . .	5	3
Totals . . . . .	14	7

The mines at which the fatalities occurred were: Rambler-Cariboo, Slocan, 1; Centre Star, Rossland, 1; War Eagle, Rossland, 1; Granby mines, Phoenix, 2; Rawhide, Phoenix, 2; Jewel, Greenwood, 2; Hedley, Similkameen, 1; Britannia, Vancouver, 1; Granby, Anyox, 3; total, 14.

The causes of death were: Drilling into unexploded powder, 1; premature blasts, 4; from powder fumes, 3; falling down winze, 1; falls of ground, 3; by mine car, 1; returning on unexploded shot, 1; total, 14.

#### VIPOND.

The foundations for the cyanide plant at the Vipond mill have been completed and there should be no great delay in erecting the machinery and tanks when they arrive.



## PERSONAL AND GENERAL

Mr. A. E. Blair is now general manager of the ranches, mines and other properties of Francisco Madero (Sr.) in Mexico.

Mr. J. Swent, formerly of the Buffalo mine, is now in California.

Mr. J. Siefert, formerly at Copper Cliff, is now on the staff of the Mond Nickel Co.

Mr. R. E. Hore has returned to Toronto from Calgary.

Mr. A. J. Young was in Calgary for two weeks in July.

Mr. J. C. Murray is in Calgary.

Mr. Geo. B. Burchell spent three weeks last month in Nova Scotia examining some coal properties for Montreal parties.

Mr. A. H. Bromley, who some years ago was engaged in mining in Atlin camp, B.C., and afterward in Mexico, has returned to British Columbia and is now in charge of development work on the Silver Creek group on Hudson Bay mountain, Omineca division.

Mr. Walter Campbell, formerly outside superintendent for the Crow's Nest Pass Coal Co. at its Coal Creek colliery, near Fernie, B.C., is now with the Brazeau Collieries, Ltd., at Nordegg, Alberta.

Mr. James Cronin, of Spokane, Washington, for a number of years manager of the St. Eugene lead mine in East Kootenay, B.C., has recovered from his recent illness and gone to Babine mountains, Omineca division, where he has mining property in course of development.

Mr. Clarence Cunningham, who used to have his headquarters in Seattle, Washington, at the end of June went from Spokane to Sandon, Slocan district of British Columbia, to investigate progress at the Wonderful mine, in which he is interested.

Mr. W. D. Dalglish, in charge of the Mineral Section of the Canadian Government Exhibition Commission, is in British Columbia, with Mr. Wm. Thomlinson, mineral collector for the Commission, getting together a thoroughly representative collection of the minerals of the Province for display at the Panama-Pacific Exposition in San Francisco, California, next year.

Mr. W. B. DeWitt, for several years in charge of gold-milling operations at the Queen 20-stamp mill on Sheep creek, Nelson mining division, British Columbia, with several associates has leased the Porto Rico mine and small mill, near Ymir, in the same mining division.

Mr. R. G. Drinnan, who was for years superintendent of coal mines of the Crow's Nest Pass Coal Co., in British Columbia, and afterward of the Hosmer colliery, in the same district, has been giving expert evidence at an official investigation following the recent calamitous explosion at the Hillcrest colliery, in Blairmore-Frank district, southwest Alberta. Mr. Norman Fraser, formerly Provincial Inspector of Mines for Alberta, was also similarly engaged to make an examination of the mine and express his opinion as to the cause of the disaster.

Dr. C. W. Drysdale, of the Geological Survey of Canada, is now at Rossland, B.C., obtaining additional data for the completion of his report on that camp, in connection with which he spent half of last year investigating the geology and mineral deposits of the locality, following several seasons' field work previously done by Dr. R. W. Brock, now Deputy Minister of Mines for Canada.

Mr. Samuel S. Fowler, general manager for the New Canadian Metal Co., owning the Bluebell lead mine and concentrating mill near the east shore of Kootenay lake. British Columbia, has returned to Riondel from a business visit to San Francisco, California.

Mr. J. D. Galloway, assistant Provincial Mineralogist for British Columbia, is spending the summer investigating mining conditions and properties in the country traversed by the Grand Trunk Pacific Railway between New Hazelton, in Skeena district, and the eastern boundary of the Province.

Mr. C. P. Hill, of Montreal, director in the Hillcrest Colliery Co., Alberta, and the Pacific Coast Coal Mines, Ltd., Vancouver Island, B.C., is paying a visit to the latter Province.

Mr. Lionel E. Hill, assistant to the manager of the Le Roi No. 2 Co.'s Josie group of mines at Rossland, B. C., has gone on a round trip to Japan, expecting to return to British Columbia a few weeks hence.

Mr. A. W. B. Hodges, of Los Angeles, California, late general manager for the Cerro de Pasco Mining Co., at Lima, Peru, was in Vancouver, B.C., recently, on his way to visit the Granby Consolidated Co.'s Hidden Creek mines and smelting works near Granby bay, Observatory Inlet.

Mr. Joseph S. C. Hudson, of the Explosives Section of the Canada Department of Mines, has been at Hillcrest, Alberta, making an investigation there following the recent explosion in a coal mine there.

Mr. R. G. McConnell, of the Geological Survey of Canada, is engaged in geological work on Hudson Bay mountain, in Omineca mining division of British Columbia.

Mr. H. J. Pollard, late consulting engineer for the Pollard Florence Mining Co., Goldfield, Nevada, U.S.A., is now with the Broken Hill Mining and Milling Co., which is developing a silver-gold-copper property on Bridge river, Lillooet district, B.C.

Mr. Robert C. Stiehl, who prior to his leaving the United States for Tasmania was superintendent of the A. S. & R. Co.'s smelting works at Great Falls, Montana, and has since been general manager for the Mount Lyell Mining and Railway Co., Ltd., is now president of the Mount Lyell School of Mines, which is affiliated with the University of Tasmania and is established at Queens-town, near the Mount Lyell copper mines and smelting works, on the west coast of Tasmania.

Mr. Norman Stockett a few weeks ago left the mines of the Consolidated Mining and Smelting Co., at Rossland, B.C., to take the position of mining engineer for the Paragon Consolidated Mining Co., operating in the Coeur d'Alene district, Idaho, U.S.A.

Mr. Arthur L. Walker, professor of metallurgy at the School of Mines, Columbia University, New York, left Vancouver, B.C., on July 9 by the "Empress of Asia" on a vacation visit to the Orient. After touring parts of China and Japan, he will return to New York via the Suez canal and Europe.

Mr. Louis A. Wright, of New York City, was at Rossland, B.C., in the early part of July.

The Roberts & Schaefer Co., engineers and contractors, Chicago, have just been awarded a contract by the Elkins Coal & Coke Co., for a large Marcus patent fireproof coal tipple for installation at Masontown, W. Va. Approximate contract price, \$24,500.

The efficiency of asbestos roofing as a fire stop is illustrated by the fact that, in the Salem fire, sparks



and burning embers were literally showered upon the roof of the Naumkeag Steam Cotton Co.'s storehouse, yet this building was absolutely unharmed because protected by J.M. Asbestos Roofing, while other buildings all around it were burned to the ground.

Roberts & Schaefer Co. has been awarded by the Clinchfield Coal Corporation a contract for the building of a large Marcus patent coal tippie for installation at their mine at Dante, Va. Contract price approximately \$55,000.

The Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa., announces that it has supplied the following apparatus to metal mines during May, 1914:

August Mining Co., Landusky, Mont. Three 75-kw., 11,000 volt, type SK transformers; one electrolytic lightning arrester; one complete switchboard equipment; one 125 h.p. belted motor for tube mill drive; one 35 h.p. motor for driving rolls; one 25 h.p. motor for driving crusher; one 15 h.p. motor for driving belt conveyor; one 10 h.p. motor for driving air compressor for agitator; two 7½ h.p. motors for driving triplex plunger pumps; one 3 h.p. motor for driving placer firer; four 7½ h.p. slow speed motors for driving slime pumps; complete line material for 23,000 volt high tension line; two 4 kw. type S lighting transformers.

Anaconda Copper Mining Co., Boston and Montana Reduction Dept., Great Falls, Mont. Four 30 h.p. motors with P.B. brakes. These motors are to control 8 ft. gate valves in the air line supplying blast to the copper furnaces.

Anaconda Copper Mining Co., Butte, Mont. Three 3½ ton, 18 in. gauge, 250 volt bar steel locomotive with 901-B equipment. The above are to be exact duplicates of locomotives previously furnished this customer, making approximately the fifth repeat order for this class of machine.

International Smelting & Refining Co., Miami, Ariz. Seven 50 h.p. back geared A.C. mill motors with magnetic brakes for operating 12 ft. Great Falls type converters; two 150 h.p. motors for belt driving rolls and crushers; two 35 h.p. back geared D.C. mill motors for matte casting machines; ten D. C. mill motors with brakes and magnetic control. All of the above apparatus for a new copper smelter.

Anaconda Copper Mining Co., Butte, Mont. Four 7½ h.p. motors for fans; one 35 h.p. motor with double extended shaft for pump; three 5 h.p. motors; one 10 h.p. motor; one 50 h.p. motor; one 100 h.p. motor. The above for use in a new leaching plant being built at the Washoe smelter.

International Smelting & Refining Co., Tocal, Utah. Two 10 h.p. motors; two 3 h.p. adjustable speed, totally enclosed, back geared commutating pole D. C. motors with drum controllers; two 5 h.p. motors; one 75 h.p. motor. The above for a sintering plant in an old smelter.

International Smelting & Refining Co., Tooele, Utah. One motor generator set, switchboard and regulating devices for Cottrell fume deposition process.

Ray Consolidated Copper Co., Hayden, Ariz. Sixteen 10 h.p. special vertical slow speed motors. The above for driving agitators in an installation using the oil flotation process.

Fraser & Chalmers of Canada, Limited, of Montreal, have been awarded a contract by the Siemens Company of Canada Limited, for a 2,000 k.w. steam turbine, condensing plant and pumping equipment. This machinery

will be installed by the Britannia Mining & Smelting Company, Limited, at Britannia Beach, B.C.

Utah Copper Co., Magna, Utah. Seven 10 h.p. special vertical slow speed motors. The above for driving agitators in an installation using oil flotation process.

Daly West Mining Company, Park City, Utah, one 300 h.p. 2,200 volt hoist motor with liquid controller and complete switchboard equipment.

Alaska Gastineau Mining Co., Juneau, Alaska, one 6-ton storage battery locomotive; one 50 kw. motor-generator set.

Empire Mines & Investment Co., Grass Valley, Cal., one 500 h.p. motor; one liquid controller for the above; three 200 kva. 4,000 volt O.I.S.C. transformers; one 3-phase induction regulator, 45 kw.; six 35 h.p. special back geared stamp mill motors. The above 500 h.p. motor is for double drum hoist. The control equipment furnished will include all switchboard apparatus and a number of special safety devices.

Cahmet & Arizona Mining Co., Bisbee, Arizona, two 300 kva., 3 phase O.I.S.C. transformers and switchboard equipment.

## BOOK REVIEW.

**CHEMICAL REAGENTS, THEIR PURITY AND TESTS**—by E. Merck—Translated by Henry Schenck D. Van Nostrand Company, New York—Price \$1.00 net—For sale by Book Department, Canadian Mining Journal.

This is the second edition of "Prüfung der chemischen Reagenzien auf Reinheit," presented in English.

The text has been adapted to the needs of American chemists, and it has thus been necessary to deviate somewhat from the German standard. For the most part, however, it is a close translation of the German text.

The properties of reagents are stated and several tests are given for the determination of the purity of the materials. One hundred and eighty-six pages are devoted to the description of properties and tests. In addition there are tables of atomic weights and of methods of preparing test solutions in common use.

## OBITUARY

Mr. Arthur A. Austin, chief chemist at the International Smelting & Refining Co.'s smelter at Tooele, Utah, met his death on June 29 as the result of an accident which occurred at the works while he was experimenting with oil as fuel for the smelter furnaces. With an assistant, he was engaged in pumping oil by air pressure when the oil tank burst, and both men were drenched with oil. The assistant escaped without injury, but the oil on Mr. Austin caught fire, and he was seriously injured before the burning clothing could be torn from his body. He was hurried to the hospital at Tooele by special train, but despite prompt surgical attention, he died a few hours later. He had been employed at the Tooele smelter for about four years, and previously for a similar period at the smelting works at Anaconda, Montana. In 1909 he married Miss Marion Hodges, one of the daughters of Mr. A. B. W. Hodges, then general superintendent for the Granby Con. M. S. & P. Co., at Grand Forks, B.C. He leaves a widow and an infant daughter. His parents are Mr. and Mrs. L. S. Austin, of Salt Lake City, Utah, U.S.A.



## SPECIAL CORRESPONDENCE

## COBALT, GOWGANDA AND SOUTH LORRAIN

There have been several inevitable occurrences in the Cobalt camp within the past month which have led to a strong reaction from the prevalent high optimism a year ago, in regard to Cobalt's future. The extreme optimism with which many outsiders viewed the camp a year ago was no more shared by engineers here than

No one with any knowledge of the camp will strive to contend that the camp is not past its zenith; the apex was reached in production three years ago, in actual value two years ago. But there will be no sudden decline such as many who are but superficially acquainted with the camp would have us consider.

There have been gains within the past six months. At the Kerr Lake one or two small veins of good ore not hitherto discovered have been unearthed under



Scenes on a Northern Ontario Canoe Route

the extreme pessimism which is just as manifest now that the Hudson Bay has closed down, the Nipissing has found nothing in their big vein at 900 ft., and there have been several other manifestations of the depletion of the ore reserves in several mines. But there have been gains to make up for these losses which have been known and discounted for some time in the camp; gains which have not received much credence because the public is just now generally sceptical of Cobalt and is not in a mood to receive any good news with much faith.

the lake and these are positive gains. Again several veins which have been worked underground have been found to be much better down below than on the surface, and by the measure of their betterment the ore reserves blocked out have been increased. At the old No. 3 too, several new leads have been found. These may or may not yield much ore, but they are very direct incentives to further prospecting in this famous old working in the diabase.

On Glen Lake at the foot of Diabase Mountain the Penn-Canadian has resuscitated a property which was



in the hands of the receiver for more than a year, and is shipping steadily. The Pennsylvania syndicate who have salvaged the old Cobalt Central are now in good hopes of making a mine of some permanence of the old Big Pete. The Bailey Cobalt, as a company, has gone under the flood, but as a mine it was probably never more promising. During the past three years when only it has been carefully and systematically mined it paid a good premium over and above working expenses; but expenses incurred before that period and not put in the ground, swamped it. It may very closely follow the career of the Penn-Canadian.

At the Seneca Superior, the company is at least holding its own. It has already paid over 100 per cent. on its modest capitalization, and while the enrichment is confined almost entirely to the actual veins these are very rich and very persistent along their whole length. The Gould ran into a pocket of ore and ran out of it, and the discovery on the Peterson Lake, which at first appeared to be so promising, is now very spotty.

In the very heart of the camp the City of Cobalt and the Cobalt Townsite, both controlled in England, have improved their position considerably in the last six months, and the Coniagas has good hopes of picking up the continuation of the City's veins from the shaft which is now so prominent a feature of the town itself.

This is, of course, the bright side of the shield only, but it serves to indicate that the year has not been pure loss, and that all the ore taken out is not lost without any compensation to the camp as a whole.

Dividends paid by companies in the Cobalt camp up to June 30 amounted to the enormous total of \$53,638,011. In the past six months \$4,319,879 has been disbursed in dividends. This shows a very considerable decrease from last year.

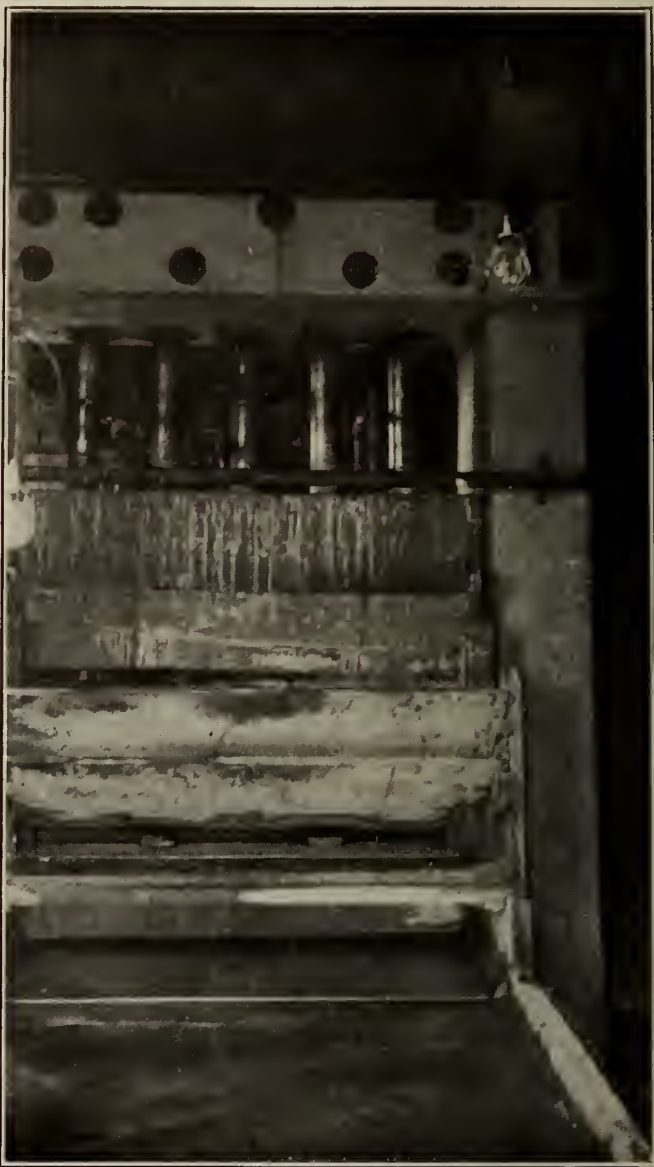
As stated in the last issue of the Canadian Mining Journal the result of the exploration work on the Nipissing at the 900-ft. level, has not yielded promising results. It will be remembered that for the past year a shaft has been put down vertically in order to tap the No. 64 vein some distance below the conglomerate in the Keewatin and decide whether there was any promise of reward of exploration in that formation in this particular section of the camp. The last monthly report states in regard to this work:—"No. 64 vein was encountered at the 900-ft. level. The vein varies in width from four to seven ft., whereas it was only 18 in. wide at the upper levels. Some of the vein is similar in appearance to that where previously encountered. Silver contents are now practically nothing. After continuing the cross-cut for 30 ft. past the vein drifts were started east and west. Further drifting will decide what the next development will be."

The estimated net production from the Nipissing mine for the month of June was \$183,558 as compared with \$211,256. Bullion from Nipissing and customs ore was shipped of an estimated net value of \$360,486.

Most of the month's work underground was done from shaft 73 on veins 73 and 98. In addition to these main producers four branch veins are being developed by drifts. The branches vary in width from one to two in. and the grade averages about 1,800 oz. The drifts are producing a small amount of high grade ore but will eventually send a large amount of low grade to the mill.

The Little Silver vein is still good. From the stope came most of the ore on the west side of the lake, the vein averaging 2,500 oz. over a width of 2 in. During the month a crosscut found the vein 40 ft. higher than the top of the second level stope, and it is fine high grade.

A change is made in the management of the Trethewey Cobalt mine by the retirement of Mr. H. G. Young, who leaves Cobalt to become consulting engineer of the Algonian Development Company, a Belgian syndicate with a Canadian charter. Mr. Young



**Tough-Oakes Stamp Mill**

has been at the Trethewey two years after leaving the Hudson Bay, and he made an excellent record there managing to pay dividends each year, and at the same time to find more ore to take the place of that mined. He was given a silver service by the staff when he left. He will superintend operations at properties of the syndicate so far apart as Renfrew County and Alaska, and will make his headquarters at Montreal.

Another loss to the camp is the resignation of Mr. R. H. Hutchison from the Coniagas staff. Mr. Hutchison will take charge of the mining branch of the Sudbury High School, succeeding Mr. McKay, who has become private secretary for Mr. R. W. Brock, the Deputy Minister of Mines at Ottawa.



Dividends paid by Cobalt companies to June 30, 1914, are:—

	P. C.	Amount
T. & H. B. ....	25,000	\$1,940,250
Cobalt Silver Queen ...	21	315,000
Casey Cobalt .....	15	203,249
Cobalt Lake .....	15½	465,000
Beaver Consolidated ...	20½	410,000
Buffalo Mines .....	282	2,787,000
Caribou Cobalt .....	7½	75,000
City of Cobalt .....	23	129,321
Cobalt Central .....	4	192,845
Coniagas Mines .....	176	6,640,000
Crown Reserve .....	327	5,784,082
Kerr Lake .....	174	5,220,000
La Rose Consolidated ..	64	4,600,346
McKinley-Darragh. . . .	172	4,269,597
Nipissing Mines .....	199	11,940,000
Right of Way Mines ...	12	202,260
Seneca Superior .....	102.5	490,356
Timiskaming Mining Co.	56	1,384,156
Trethewey. . . . .	108	1,061,998
Wettlaufer Lorrain ....	45	637,465
Foster Cobalt .....	5	45,774
Peterson Lake .....	1¾	43,032
Cobalt Townsite .....	97.5	966,726

\$53,638,011

Dividends paid in 1914, are:—

	P. C.	Amount
Coniagas. . . . .	19	\$720,000.00
T. & H. B. ....	900	69,849.00
Caribou Cobalt .....	5	50,000.00
Crown Reserve .....	14	247,633.96
Kerr Lake .....	10	300,000.00
La Rose .....	7	524,525.44
McKinley-Darragh. . . .	18	404,584.56
Nipissing. . . . .	17.5	1,050,000.00
Trethewey. . . . .	5	50,000.00
Seneca Superior .....	37.5	179,581.50
Casey Cobalt .....	..	93,750.00
Buffalo. . . . .	28	280,000.00
Cobalt Lake .....	5	150,000.00
Cobalt Townsite .....	20	199,953.34

\$4,319,879.80

## PORCUPINE, SWASTIKA AND SOUTH LORRAIN

Following the precedent of the McIntyre, the Porcupine Crown is making a geological survey of their property. On the McIntyre the system of faults has been examined by a geologist, with the result that the extensions of several ore bodies have been picked up. No work is proceeding at present on the 500-ft. level of the Crown, it being decided to follow the ore down from the 300-ft. level, and ascertain exactly where the break occurs. So far in the winze the bottom of the ore has not been reached.

Spectacular surface finds are again reported from McArthur township. It is stated that much visible gold has been found in the big quartz vein uncovered on the Lohner and Forbes claims. These claims are located about 50 miles due south of South Porcupine and the owners have already started on the construction of a summer trail from the end of the present government road. There is also a good canoe route.

The Dome report for June shows tons milled 18,250, gold recovered \$83,421, and values recovered per ton milled \$4.57. This is a considerable improvement from May in every respect, when the grade was \$3.83, but it is still very much lower than the average. It is anticipated that the tonnage milled will now show a substantial increase every month. There have been considerable changes in the personnel of the staff within the past month.

The six four-weekly statements of the Hollinger issued this year show that the average value of Hollinger ore has been \$14.25 per ton, and the average costs \$4.667 per ton. For the four weeks ending June 17 the average value of ore per ton treated was \$14.59, which was roughly a dollar and a half higher than the previous month. The working costs amounted to \$4.578 per ton, which also was fractionally higher. Expenditures written off for plant amounted to \$10,438 on the mill extension and \$3,328 for the sprinkler system. The mill ran 90 per cent. of the possible time, treating 13,928 tons, of which 30 tons were treated for the Acme Gold Mines. The approximate extraction was 95.2 per cent., the milling costs \$1.220 per ton, and the mining costs \$2.192 per ton.

## NOVA SCOTIA

### DOMINION COAL OUTPUTS.

The output obtained by the Dominion Coal Company's Glace Bay mines in June will in all probability stand as the maximum monthly output of this company for some time to come. The tonnage raised was 452,270 tons, which compares with the largest previous output of 438,272 tons produced in October, 1913. Notwithstanding the large production in June it would have been much larger had it been possible to work the mines to full capacity, as but for the enforced idle time the output would have reached 490,000 tons, or 50,000 tons greater than the previous maximum.

For many years past now your correspondent has had occasion to record a continuously increasing production by the Dominion Coal Company, every month showing an increase over its predecessors, but the slackening in demand which has been threatening the coal-trade for some time past has now developed to an appreciable extent, and it will shortly become necessary to record a diminution in production. In July the Glace Bay outputs will probably not exceed 380,000 tons, or about 100,000 tons less than the capacity of the collieries if operated full time.

All the Nova Scotian mines are affected by the depression, those on the mainland more so than the island collieries. Up to the end of the half year, however, very little reduction will be shown as compared with last year's figures, and for this reason the royalty returns of the Nova Scotia Government will show but a small shrinkage, as the Government's fiscal year ends 30th September.

The production of the Dominion Coal Company for the first half of 1914 was 2,254,043 tons from the Glace Bay mines and 199,961 from the Springhill mines, comparing with 2,295,082 tons from Glace Bay and 193,797 from Springhill in the first half of 1913. There is, therefore, only a difference of 34,000 tons between the two half years.

A fire which may prove serious occurred during July in the McGregor pit at the Albion mine of the Acadia Coal Co. Owing to the dangerous conditions attend-



ing the attempts which were made to extinguish the fire it was found necessary to seal the pit. It is not known when attempts at reopening will be made. The Acadia Coal Company have in recent years spent a considerable amount of money in modernizing this colliery. Many extremely serious fires have in the past been successfully fought in Pictou County mines, and it is to be hoped that the Acadia Company will be equally successful in the present instance.

### BRITISH COLUMBIA

Reports of new strikes of placer gold in two or three different parts of Cariboo district have recently been published in provincial newspapers, but authentic in-

formation in confirmation has not yet been received. One report was to the effect that gold had been found on Willow river, low down toward its confluence with Fraser river. Another gave the neighborhood of Quesnel as the scene of a new discovery. As both rivers flow through country in which much gold has been recovered over a long period of time, it is, of course, quite possible that new finds may be made, but it is a fact that notwithstanding its having been prospected by numbers of the old Cariboo miners little pay ground was found well down Willow river, so old-timers are not yet attaching much importance to the reports so far as that stream is concerned.

#### Rossland.

Another copper smelting furnace having been blown in at the Consolidated Co.'s works at Trail, a larger

quantity of ore is being shipped from the company's mines in Rossland camp. The total quantity of ore shipped hence to Trail during four weeks ended May 28, was 19,495 tons, which was an average of 4,874 tons a week; during four weeks ended June 25, it was 19,779 tons, an average of 4,945 tons; for the week ended July 2 the quantity was 6,622 tons. Of the total of 45,896 tons shipped during the nine weeks, only 4,343 tons was custom ore, that having been sent to the smelter from the Le Roi No. 2 Co.'s Josie group of mines; the larger part was from the Consolidated Co.'s mines, namely, Centre Star group 28,604 tons, and Le Roi 12,949 tons. The output from the Josie group was larger in June than in May, it having aver-

#### BOUNDARY.

##### North Fork of Kettle River.

The Union claim, in Franklin camp, on the east fork of the north arm of Kettle river, about 50 miles from



Peace River Coalfield—Measures showing on Johnson Creek.



Grand Forks, continues to ship ore of a sufficiently high grade to leave a good margin of profit above freight and treatment charges of approximately \$30 a ton. The ore occurs in what is described as a vein of dark blue silica containing small quantities of iron pyrites. In an open cut the vein is about 8 ft. in width. While consisting largely of silica it does not appear to be a true quartz vein, but is rather a complete replacement of limestone, probably along a fissured zone. The vein matter is about three-quarters quartz, the remainder being calcite and iron pyrites, with a little hematite and garnet. The gold value is probably associated with the iron pyrites, while the silver seems to occur as silver sulphide, and possibly in part as ruby silver. The ore is deceptive in appearance, as it shows very little mineralization and would hardly be taken at first glance as high-grade ore. The ore as shipped to the smelter in carload lots assays about \$60 a ton. The district was visited late last autumn by Mr. J. D. Galloway, assistant provincial mineralogist, whose report on it has been published, and now another engineer is reporting on the camp for the Department of Mines.

years of age, was born at Woodstock, Ontario. He went to Phoenix from Michigan. Tatham's native place was Magog, Province of Quebec. He was 61 years of age and had been 14 years with the Granby Co.

### COAST.

#### Vancouver Mining Division.

The Britannia Mining and Smelting Co. has well on for 100 men at work prospecting and developing mineral claims in the mountainous country surrounding its Britannia group of mines. Two properties in particular are being developed under option of purchase, namely, the Red Mountain group, at the head of Stawamus river, which flows into Howe Sound at its head near Squamish, the present tidewater terminal of the Pacific Great Eastern Railway, now in course of construction northward through Lillooet and Cariboo districts to Fort George, and the Bank of Vancouver group, near the head of Seymour creek which flows in the opposite direction and enters Burrard inlet across the water from the City of Vancouver. On the latter group there are known to occur two parallel



Granby Smelter, Granby Bay, B.C.

#### Phoenix.

Three men were killed by a fall of rock at the Granby Consolidated Co.'s Knob Hill mine, near Phoenix, on July 5. They were J. F. McDougall and Wm. Tatham, shift bosses, and Frank Riordan, motorman. According to evidence adduced at an inquest held by the district coroner, the fatality occurred in No. 2 adit of the mine, near where the cars enter and leave the big "gloryhole," in which an electrically operated Bucyrus shovel had recently been installed. A mass of rock, estimated at more than 1,000 tons, came down without warning, burying the three men and the electric motor, of which Riordan was in charge. The accident happened shortly after nine o'clock in the morning. When it was found that three of the morning shift were missing, as many men as could work with expedition and the big shovel were employed removing the fallen rock, but it was not until late at night of the following day, after about 37 hours' work, that the last of the bodies was recovered. A verdict of "unavoidable accident" was returned. McDougall's body was sent East, for burial near his old home on Prince Edward Island, while the bodies of Riordan and Tatham were buried near Phoenix. Riordan, who was about 38

veins, between 200 and 300 ft. apart, traced for a distance of fully 1,000 ft. One of these has been cross-cut 25 ft. without reaching the other wall; it is a massive body of copper ore, running about 4 per cent. copper with some gold. A crosscut adit is being driven to cut this ore body at approximately 300 ft. lower down the mountain. This adit was in 250 ft. at the end of June, and was believed to be nearing the ore-body, it is about 6 ft. wide by 7 ft. high, and is intended to be used as a working tunnel until much more development shall have been done. The showing of ore on the Red Mountain group is not so large, but this is also a promising property. The ore runs 4 to 5 per cent. copper and \$3 to \$4 a ton in gold. This has also been opened by adits, but there is also quite a big bluff in which there is a fairly good showing of ore.

#### Texada Island.

The Provincial Department of Mines has published a report by Mr. Donald G. Forbes on a number of mining properties in the lower Coast district. One of these is the Marble Bay mine, owned by the Tacoma Steel Co., of Tacoma, Washington, and situated near Van Anda on the east side of Texada island about five



miles from its northern end. This mine has been shipping ore to Tacoma for a number of years; it is remarkable on account of the unusual depth at which bornite occurs in it. Mr. Forbes reports, in part:

"The mine is situated in limestone cut by numerous dikes of diabase, along some of which considerable movement has taken place. Since the intrusion of the dikes fresh movements have occurred and new fracture planes have been formed. It is along these later lines of fracture that the ore bodies are found, and that alterations and replacements have been made in the limestones. The mineralization, consisting of chalcopyrite and bornite containing some gold and silver, occurs in a gangue of felsite, gametite, and some tremolite. Native silver is also found in the mine, though not often present in great quantity.

"The main shaft has been sunk to a depth of 1,000 ft., and from this level, at a point 180 ft. north of the main shaft, another vertical shaft or winze has been sunk for 300 ft., making the bottom level 1,300 ft. vertically below the surface, and 1,250 ft. below sea-level. The 1,200 and 1,300 ft. levels are being worked at present, and exploration work is being carried on along the fracture planes and following small stringers of ore. One fair-sized pocket of ore has been found between the 1,300 and 1,200-ft. levels and is now being stoped out. The ore consists of chalcopyrite and bornite in a gangue of lime, felsite, and garnetite. Bornite is present in considerable quantity in this ore, and is here found at a depth of more than 1,200 ft. below sea-level, an occurrence quite unusual at such a depth. The stope also contains some banded siliceous ore of a kind not found in other parts of the mine. A winze has been sunk for 40 ft. on the incline below this stope, but as it did not disclose anything of value sinking here was discontinued.

"The principal exploration work in the mine has been carried out in a north-and-south direction, as the irregular and disconnected bodies in which the ore occurs pitch to the north. The orebodies are distributed over some 300 ft. from east to west, and very little exploration work has been done beyond these limits. The orebodies are irregular in form and extent and are disconnected; they vary from small kidneys to large deposits."

#### Observatory Inlet.

The Granby Consolidated Co.'s hulk "Gerard C. Tobey," formerly an American barque, which left Tacoma, Puget Sound, on July 3 in tow of the steamer "Amur," was wrecked in Seymour Narrows, off Vancouver island, on Sunday morning, July 5. She was laden with 1,581 tons of coke for the company's smelter at Anyox, Granby Bay. When in the narrows the strong tidal current caused the hulk to sheer so that she struck a rock which so damaged the hull that the vessel sank in deep water. It is thought that both hulk and cargo are a total loss.

#### Portland Canal Division.

Three men who left Stewart several weeks ago to explore the country between that town and Groundhog coal basin, with the object of finding a better route for a trail between these places than that now in use, reached Hazelton after a hard trip of 22 days, during which they covered a distance of about 275 miles. Development work on coal lands in the basin being seriously retarded by transportation difficulties and heavy costs—the packing charge from Hazelton, which is 180 miles by rail from Prince Rupert, to the Groundhog field, being 20 cents per pound—the

Provincial Government is seeking a trail route with an easier grade and shorter in distance than either the existing one from Hazelton or that from Stewart. A route was found 40 miles shorter and with a maximum elevation of 3,500, as against 5,200 ft. now reached by the trail in use.

During the month of June the Portland Canal Tunnels, Ltd., advanced its main adit 122 ft. and the drift on its Lucky Boy claim 147 ft. At the beginning of July the face of the Lucky Boy drift was in a strong vein of quartz and pyrite, but value of this ore was low. At 3,368 ft. in from its portal the main crosscut adit, which had previously passed through several veins, appeared to be breaking into another vein, for pieces of ore were found there. This was the best-looking showing that had been opened by the crosscut.

#### Omineca Division.

Ore is being taken from Hunter basin down to Telkwa whence a carload shipment—the first from this place—will be made. The ore is from the Thomann property; its chief valuable metal content is silver, and it is expected that smelter returns will show it to be high-grade ore. W. Hunter, who has been working in the basin off and on during the last eight years, has about 200 tons of ore ready for shipping, which will be commenced soon, after completion of the wagon road now being constructed to his property.

Another car of ore from the American Boy, owned by the Harris Mines, Ltd., near New Hazelton, is to be shipped from there early in July. This ore is from the shaft on No. 1 vein; it will be smelted at the Consolidated Co.'s smelter at Trail.

#### MEXICAN PETROLEUM.

N. Y.—Accompanying annual report of Mexican Petroleum Co., Pres. Doheny presents a statement to shareholders regarding history of the company, its present position in Mexico and effect of disturbed governmental conditions, in which he says: Company officials have always endeavored to hold the company neutral with reference to politics and contrary to general opinion the company has found the Mexican "peon" a most satisfactory employee.

The statement says: "In brief your company discovered the basis for, and pioneered development of, a hitherto unsuspected resource in the republic of Mexico, which increased wages and brought about better conditions of living for all the poor people, which increased land values, which gave increased business to the farmers, merchants, bankers and artisans, reduced cost of operation to railroads and other industries, all without taking away anything the existence of which had theretofore been known or even suspected. We claim those who include petroleum companies among corporations that have exploited the people of Mexico or their country disadvantageously, are misinformed."

Regarding withdrawal of Americans from Mexico in latter April and early May, Pres. Doheny says: "The product of your continuously flowing wells was so faithfully conserved by Mexican employees in charge that your general manager was able to report that not more than 5,000 barrels of oil were lost during the 30 days' absence of your American employees from the properties.

"The present, though apparently cloudy and uncertain, shows evidence of the nearness of a future brightening by auspicious events which portend the establishment of peace and order in the republic of Mexico."

During 1913 company's total sales were 12,325,228 barrels for which was received \$7,115,092.



**CANADIAN COLLIERIES, LTD. VS. DUNSMUIR.**

Advices recently received from London, England, by the Canadian Collieries (Dunsmuir), Limited, are to the effect that the company's appeal in its action against the Hon. James Dunsmuir, of Victoria, Vancouver Island, British Columbia, has been allowed by the Privy Council, while the cross appeal of Mr. Dunsmuir against the company has been dismissed.

About four years ago Mr. Wm. Mackenzie, of the well-known railway-building firm of Mackenzie & Mann, of Toronto, obtained from Mr. Dunsmuir and his associates, who owned and had been operating for years the Union colliery in Comox district and the Extension colliery in Cranberry district, both on Vancouver Island, an option of purchase on all the coal properties and other interests of the Dunsmuirs in their coal mining, shipping, and selling business. The purchase price was stated to have been \$11,000,000. It was agreed that until such time as the Mackenzie & Mann interests should be prepared to take over and operate the coal mines the Dunsmuirs should continue to keep the business going as usual and for doing so should receive the profits on same. Later, the purchasers having meanwhile acquired possession of the mines and undertaken their operation together with the carrying on of all the business connected therewith, disputes arose as to the meaning of certain terms of the purchase contract. The sellers disputed several important claims of the buyers, chiefly that the assets covered by the sale did not include two colliers engaged in the coal trade between Vancouver Island and San Francisco (the latter place being the chief market for the product of the coal mines concerned), nor a reserve stock of coal in Vancouver city valued at about \$160,000, nor approximately \$500,000 in cash in the bank, which cash was distributed by the Dunsmuirs among themselves as a dividend before Mackenzie & Mann took over the property.

While the total amount in dispute was nearly \$1,000,000, the final result of the actions at law between the parties does not mean that so large an amount has now to be paid to the Canadian Collieries (Dunsmuir) Limited, for there are certain amounts acknowledged to have been due to the Dunsmuirs, primarily the profits from the business during the five or six months they operated it under the agreement above mentioned. The Canadian Collieries Company, however, will benefit by the final judgment to the extent of between \$400,000 and \$500,000, which is the approximate amount in favor of the company still to be received by it.

**BLAIRMORE—FRANK DISTRICT.**

The financial statement of the McGillivray Creek Coal & Coke Company, Limited, which held its annual meeting last month in Spokane, is just being printed and will be distributed to the shareholders of the company in a few days. The company's mine is in the foothills of the Rocky Mountains at the Alberta end of the Crow's Nest Pass.

That the McGillivray Company is on an excellent footing and is making highly satisfactory progress is indicated in the statement. The figures are for the year ending March 31, 1914. The item of chief interest is that of the net profit for the year, which is entered at \$87,377.02. The balance sheet is certified to by James B. Sutherland, chartered accountant, Calgary. The total assets of the company are placed at \$3,207,131.53. This includes \$211,261.21, as the value of plant,

buildings, roads and railway sidings, also \$2,297,724.45, as the value of coal lands.

In his report to the shareholders, the president, Mr. Lorne A. Campbell, of Rossland, states that the development work carried on during the past year has turned out to the entire satisfaction of the company. The advance in the main entry, north, during the year was 2,413 feet. Mr. Campbell's statement goes on:

"The total tonnage of coal marketed during the past year was 198,175.65 short tons, this tonnage being distributed in Alberta, Saskatchewan, and the States of Washington and Idaho. In addition to the tonnage as stated, we had ready for immediate extraction on March 31, 1914, 659,728 tons.

"During the past year we have added to our equipment thirty steel pit cars of four tons capacity each, one 65-h.p. boiler, one 160-h.p. engine, one 100-k.w. generator, as well as motors having capacity of 75-h.p., also two 6-ton electric storage battery locomotives for underground haulage.

"During the past year the mine worked 274 days, which goes to show that the delays during the operative period have been very few.

"From the satisfactory profit for the year you will observe by comparison of annual statements a corresponding decrease in liabilities and an increase in assets, to which the same has been applied."

The directors of the company are: Lorne A. Campbell, Rossland, president; James A. Nowell, Spokane, vice-president; T. M. Paine, Glencoe, Minn.; Fitzhugh Burns, St. Paul, Minn.; W. E. Cullen, jr., Spokane, secretary and treasurer; George Kellock, Coleman, Alberta, colliery manager.

**TORONTO UNION STATION.**

The P. Lyall & Sons Construction Company, Ltd., has been awarded one of the largest contracts ever given to one firm in Canada.

For some time bids have been asked for the construction of a new Union railway station at Toronto, the same to cost between \$4,000,000 and \$5,000,000. The tenders of the Lyall Company have proved the lowest and as the firm was in a most suitable position to handle such a large contract successfully, the contract was awarded to them. The contract is to be finished not later than July 1, 1916. Construction work will commence about the 1st of January, 1915.

This contract will place the company in a very strong position, as when the company issued its annual report in March last, it stated that over \$3,300,000 worth of contracts were being carried over into the next year. With the present contract the company's unfinished contracts will equal nearly \$8,000,000.

The station will be constructed of granite and the exterior has been designed in an adaptation of Roman classic architecture.

That the examining mining engineer is kept in training by his work was exemplified in the recent 200 mile canoe race from Mont Laurier to Ste. Rose, Que.—Mr. Jas. G. Ross, Consulting Mining Engineer, of the Milton Hersey Co., Montreal with his partner, Mr. T. M. Papineau, representing the Cartierville Canoe Club, Montreal, came second. The winners were two Gowganda prospectors, Messrs. R. Gamble and F. Thompson representing the Rideau Aquatic Club of Ottawa. The course down the Lievre and Ottawa Rivers was covered in 40 hours paddling and portaging, the elapsed time from start to finish being 60 hours.

## MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg.,  
Toronto, Ont.)

July 24, 1914.

## New York Curb.

	Bid.	Ask.
American Marconi .....	2.75	2.87
Alaska Gold .....	26.75	27.00
British Copper .....	1.37	1.87
Braden Copper .....	7.00	7.62
California Oil .....	319.00	320.00
Chino Copper .....	39.87	40.00
Giroux Copper .....	.50	1.00
Green Can. ....	30.00	32.00
Granby. . . . .	...	...
Miami Copper .....	22.12	22.37
Nevada Copper .....	1.62	1.87
Ohio Oil .....	174.00	176.00
Ray Cons. Copper .....	20.75	20.87
Standard Oil of N. Y. ....	213.00	215.00
Standard Oil of N. J. ....	401.00	405.00
Standard Oil (old) .....	1375.00	...
Standard Oil (subs) .....	975.00	...
Tonopah Mining .....	6.50	6.75
Tonopah Belmont .....	6.25	6.50
Tonopah Merger .....	.30	.32
Inspiration Copper .....	18.50	18.75
Goldfield Cons. ....	1.37	1.43
Yukon Gold .....	2.12	2.37

## Porcupine Stocks.

	Bid.	Ask.
Apex. . . . .	.01	.01½
Dome Extension .....	.09	.09½
Dome Lake .....	.38	.39
Dome Mines .....	9.00	9.70
Eldorado. . . . .	...	...
Foley O'Brien .....	.28	.31
Hollinger. . . . .	18.10	18.35
Jupiter. . . . .	.06	.06½
McIntyre. . . . .	.33	.33½
Moneta. . . . .	...	...
North Dome .....	...	...
Northern Exploration .....	1.00	1.75
Pearl Lake .....	.02¾	.03
Plenaurum. . . . .	...	.40
Porcupine Vipond .....	.23	.28
Imperial. . . . .	.01¼	.01¾
Porcupine Reserve .....	...	...
Preston East Dome .....	.01	.01½
Rea. . . . .	.10	.20
Standard. . . . .	...	...
Swastika. . . . .	.01½	.02
United . . . . .	...	...
West Dome .....	.05	.10
Porcupine Crown .....	.85	.95
Teck Hughes .....	.11	.12

## Cobalt Stocks.

	Bid.	Ask.
Bailey. . . . .	.00½	.00¾
Beaver. . . . .	.23	.23½
Buffalo. . . . .	.95	1.10
Canadian. . . . .	.08	.10
Chambers Ferland .....	.14	.16
City of Cobalt .....	.40	.44
Cobalt Lake .....	.42	.46
Coniagas. . . . .	7.50	7.70
Crown Reserve .....	1.18	1.19
Foster. . . . .	.04	.06
Gifford. . . . .	.01	.02
Gould. . . . .	.01	.01½

Great Northern .....	.07½	.08
Hargraves. . . . .	.01	.02
Hudson Bay .....	40.00	45.00
Kerr Lake .....	5.80	6.00
La Rose .....	.88	.90
McKinley. . . . .	.51	.54
Nipissing. . . . .	5.80	6.00
Peterson Lake .....	.33	.33½
Right of Way .....	.03	.04
Rochester. . . . .	...	...
Lcaf. . . . .	...	...
Cochrane. . . . .	...	.15
Silver Queen .....	...	...
Timiskaming. . . . .	.10½	.12
Trethewey. . . . .	.16	.20
Wettlaufer. . . . .	.06	.07
Seneca Superior .....	2.35	2.50

## TORONTO MARKETS.

July 28—(Quotations from Canada Metal Co., Toronto).

Spelter, 5¼ cents per lb.

Lead, 5 cents per lb.

Tin, 32 cents per lb.

Antimony, 8½ cents per lb.

Copper, casting, 14½ cents per lb.

Electrolytic, 15 cents per lb.

Ingot brass, yellow, 10; red, 13 cents per lb.

July 28—Coal—(Quotations from Elias Rogers Co., Toronto).

Anthracite, \$7.50 per ton.

Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

July 24—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, \$1.75 per ton.

Foundry coke, prompt, \$2.25 to \$2.50 per ton.

July 24—Tin, straits, 31.25 cents.

Copper, Prime Lake, 13.50 to 13.62½ cents.

Electrolytic copper, 13.25 to 13.37½ cents.

Copper wire, 14.62½ to 14.87½ cents.

Lead, 3.90 cents.

Spelter, 5.00 to 5.10 cents.

Sheet zinc (f.o.b. smelter), 7.00 cents.

Antimony, Cookson's, 7.05 to 7.15 cents.

Aluminum, 17.50 to 17.75 cents.

Nickel, 40.00 to 45.00 cents.

Platinum, soft, \$43.00 to \$44.00 per ounce.

Platinum, hard, 10 p.c., \$46.00 to \$47.50 per ounce.

Platinum, hard, 20 p.c., \$49.00 to \$51.50 per ounce.

Bismuth, \$1.95 to \$2.15 per pound.

Quicksilver, \$36.00 per 75-lb. flask.

## SILVER PRICES.

	New York	London
	cents.	pence.
July 9. . . . .	56½	25½
" 10. . . . .	56½	25½
" 11. . . . .	55¾	25¾
" 13. . . . .	55¾	25½
" 14. . . . .	55¼	25½
" 15. . . . .	54¾	25¼
" 16. . . . .	55½	25¾
" 17. . . . .	54¾	25½
" 18. . . . .	54¾	25½
" 20. . . . .	54½	24½
" 21. . . . .	53¾	24½
" 22. . . . .	53½	24½
" 23. . . . .	54¼	24½
" 24. . . . .	53¾	24¾



Has a  
specially  
compounded  
Heat  
Resisting  
Lining



## The Steam Hose That Doesn't "Cook Itself to Death"

This Goodyear Hose has a specially compounded rubber lining that prevents the steam from penetrating to the fabric. It is cured so as to be unaffected by the heat.

It is this feature that gives the wonderful durability that is winning the preference for Goodyears wherever steam hose is bought on a service basis.

Comes either marline jacketed or steel wire wound.

The wire winding protects the hose from rough handling. Saves it when tools and other heavy objects are dropped upon it. Adds to the wearing quality when hose is dragged about.

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**GOOD YEAR**  
TORONTO  
STEAM HOSE

Both styles are made to resist oil, and specially adapted for intermittent pressures.

### Hot Water Hose

For high and low temperatures. Goodyear construction throughout. Made for rough handling.

Every Goodyear Hose, whatever its purpose, is built to meet actual service conditions. No Goodyear product is ever made to meet a price. It is this Goodyear service idea which eventually saves you money and equipment.

Put your hose problems up to Goodyear experts. The Goodyear Efficiency Bureau is always at your service. Costs nothing to ask questions. No obligation involved.

### Goodyear Belting

Whatever the belt need there is the very Goodyear Belt for it—designed and built for the specific purpose—general transmission—main drive—small pulley—conveyor belts—elevator belts, etc., etc.

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1240. Victoria Memorial Museum Bulletin No. 1. Contains short scientific papers.

##### NEW BRUNSWICK and NOVA SCOTIA

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

##### QUEBEC

Memoir 43. St. Hilaire (Beloeil) and Rougemont mountains, Quebec, by J. J. O'Neill.

##### ONTARIO

Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

##### NORTH-WEST PROVINCES

Memoir 30. The basins of Nelson and Churchill rivers, by William McInnes. Map not published.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

##### BRITISH COLUMBIA

Memoir 23. Geology of the coast and islands between the Strait of Georgia and Queen Charlotte Sound, B.C., by J. Austen Bancroft.

Memoir 36. Geology of the Victoria and Saanich Map areas, Vancouver Island, B.C., by Chas. H. Clapp. Maps not published.

##### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

#### MAPS RECENTLY ISSUED:

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Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

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Map 26A. Bathurst and vicinity, Gloucester County, New Brunswick. Topography.

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Map 106A. Groundhog coal field, British Columbia. Geology.

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Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

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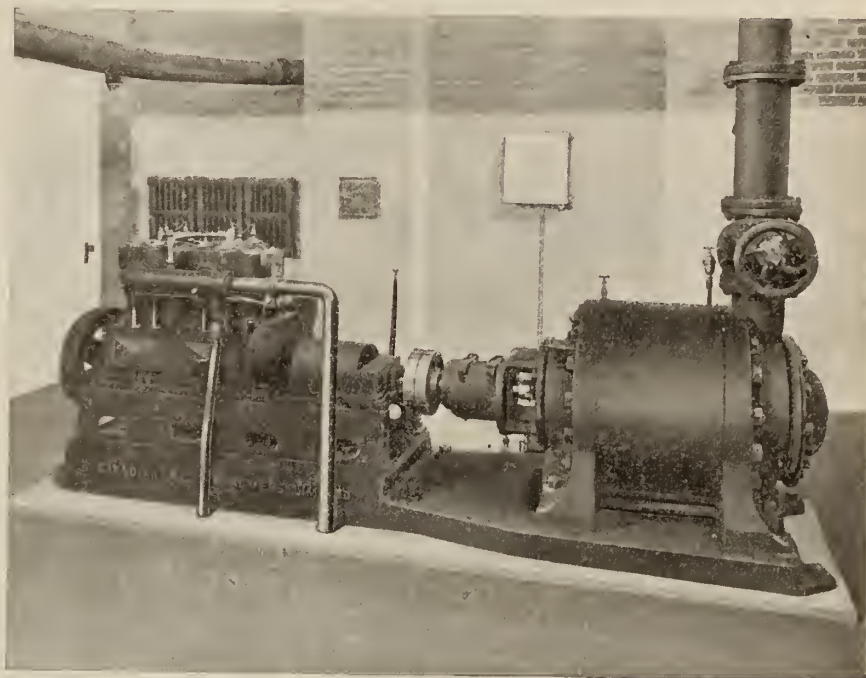
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**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.**

*When answering Advertisements please mention THE CANADIAN MINING JOURNAL.*

# Ontario's Mining Lands

---

There are many millions of acres in Eastern, Northern, and Northwestern Ontario where the geological formations are favorable for the occurrence of minerals, the pre-Cambrian series being pre-eminently the metal-bearing rocks of America.

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Building materials such as brick, lime, stone, cement, sand and gravel, are abundant.

The output of the mines and metallurgical works of Ontario for the year 1912 was valued at \$48,341,612, and for 1913 this amount will be materially increased.

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water.

A miner's license costs \$5.00 per annum, and entitles the holder to stake out three claims a year in every mining division.

For maps, reports of the Bureau of Mines, and mining laws, apply to

**HON. W. H. HEARST,**

Minister of Lands, Forests and Mines,

**Toronto, Canada.**



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Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York  
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Mussens, Ltd.  
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Dominion Bridge Co.  
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Can. Ingersoll-Rand Co., Ltd.  
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Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

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Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
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Peacock Bros.  
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Mussens, Ltd.  
Canadian Fairbanks-Morse Co.

B. Greening Wire Co., Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

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Nova Scotia Steel & Coal Co.

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Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
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Rock & Power Mach'y, Ltd.  
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## Coal Mining Explosives—

Curtis & Harvey (Can.), Ltd.

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Fraser & Chalmers, Ltd.  
Peacock Bros.  
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Can. Ingersoll-Rand Co., Ltd.

## Coal Washeries—

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Peacock Bros.

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Rock & Power Mach'y, Ltd.  
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Mussens, Ltd.  
Peacock Bros.  
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## Concentrators and Jigs—

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Fraser & Chalmers, Ltd.  
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Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Waterous Engine Works

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## Cranes—

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Peacock Bros.  
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S. Flory Mfg. Co.  
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Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.

## Drills—Diamond—

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Sullivan Machinery Co.  
Northern Canada Supply Co.

## Drill Steel Sharpeners—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

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Krupp, Fried. A. G., Germany  
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QUEBEC :	-	-	-	-	-	-	Montreal
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MANITOBA :	-	-	-	-	-	-	Winnipeg
ALBERTA :	-	-	-	-	-	-	Edmonton
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Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 32.)

- Furnaces—Assay—**  
Krupp, Fried. A. G., Germany  
Lymans, Ltd.  
Mussens, Ltd.
- Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada), Limited  
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Northern Electric Co., Ltd.  
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Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.
- Hangers—Cable—**  
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- Hand Hoists—**  
The Herbert Morris Crane & Hoist Co., Ltd.
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- Hoisting and Conveying Machinery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.
- Hoisting Engines—**  
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Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.  
Sullivan Machinery Co.  
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- Hoists—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Watrous Engine Works.
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H. W. Johns-Manville Co.  
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Can. Fairbanks-Morse Co.  
Can. Cleveland Drill Co.  
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G. Taylor Hardware Co., Ltd.
- Jacks—**  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Jigs—**  
Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.
- Lamps—Acetylene—**  
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G. Taylor Hardware Co., Ltd.  
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- Lamps—Safety—**  
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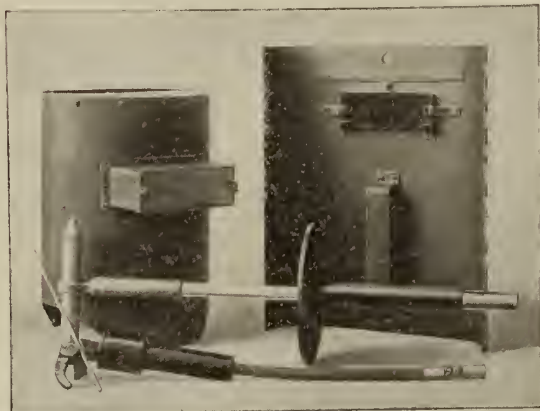


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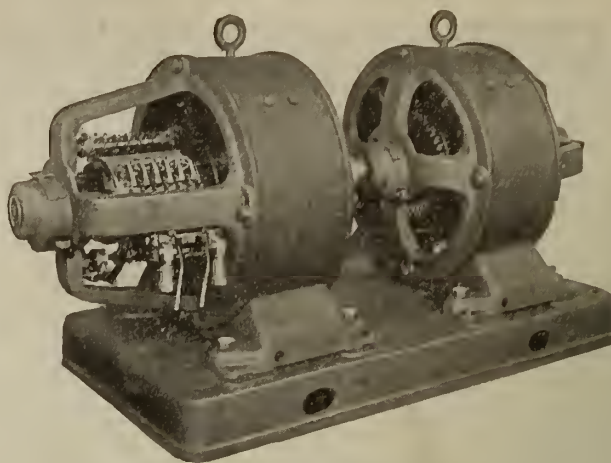
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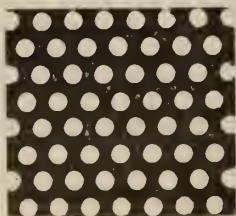
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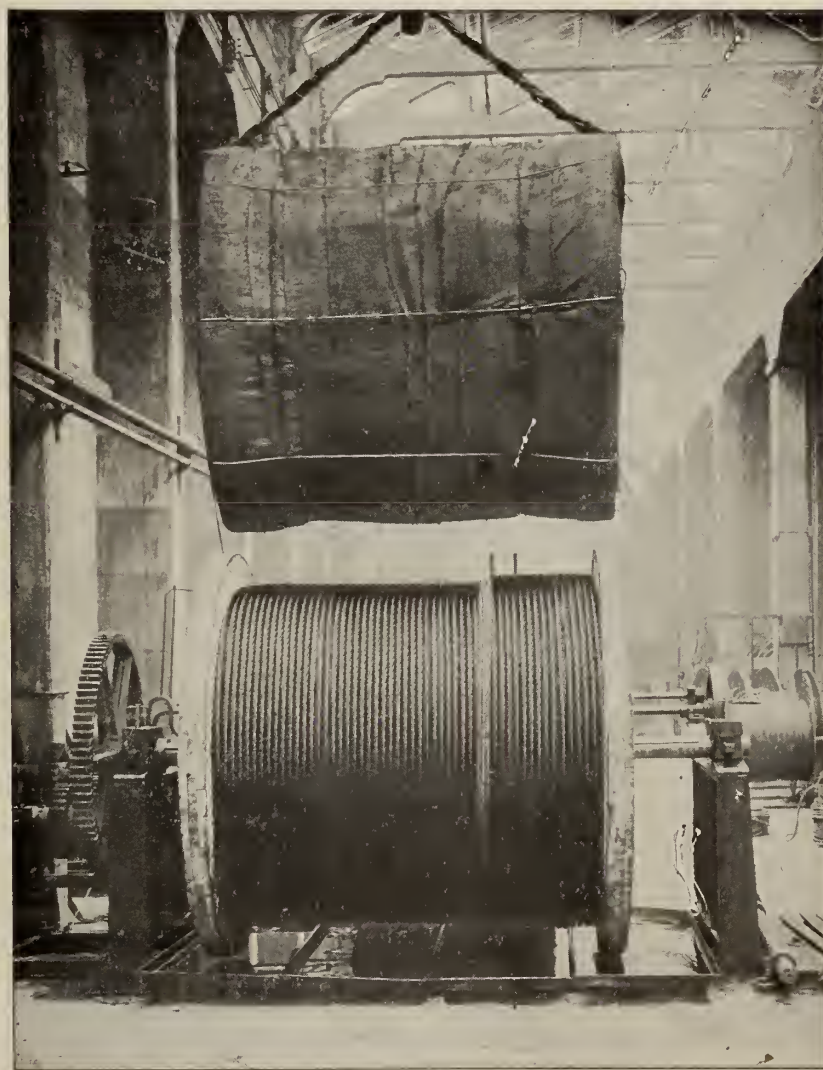
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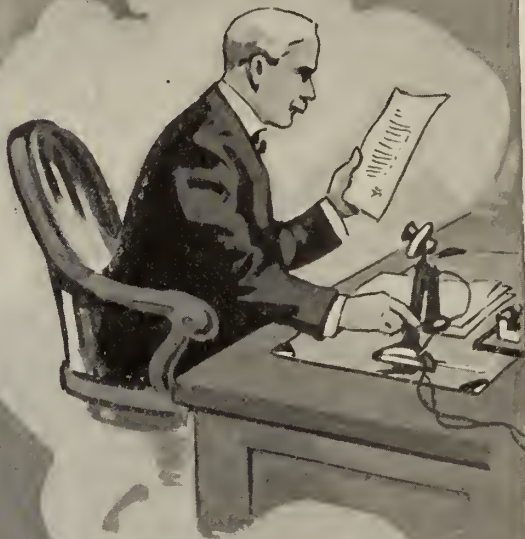
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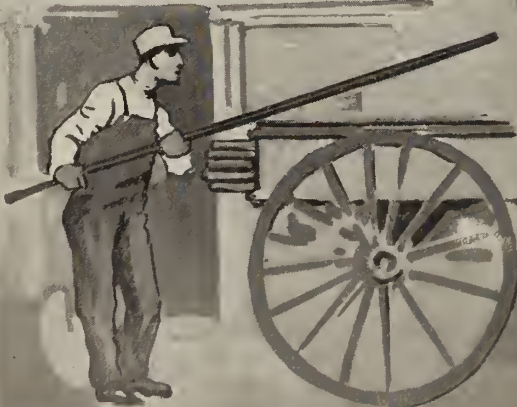
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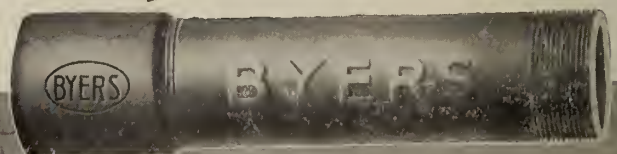
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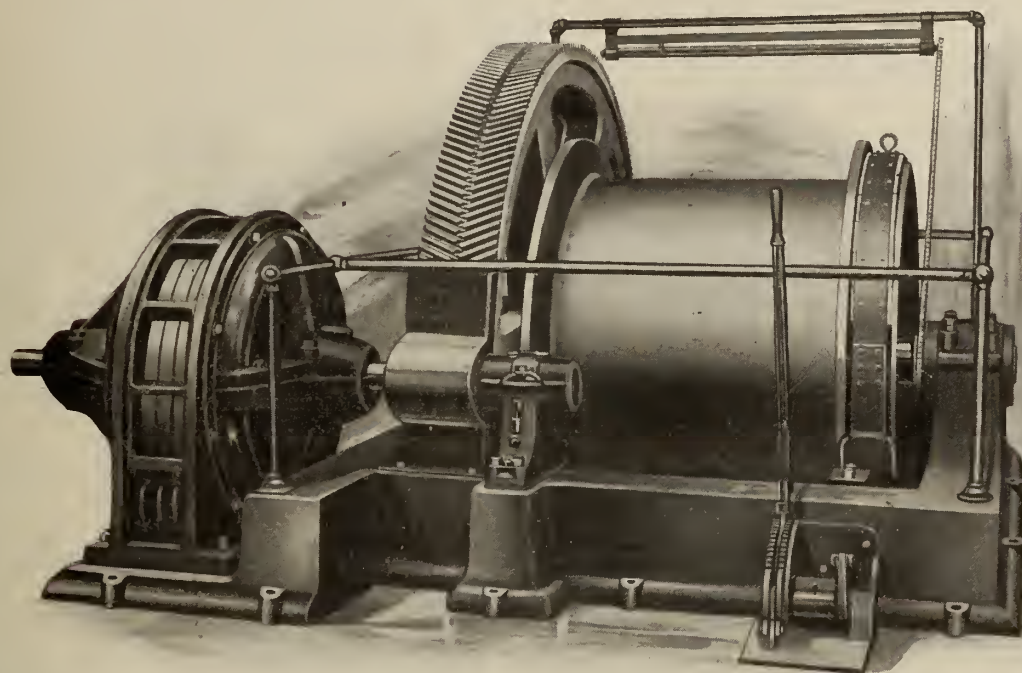
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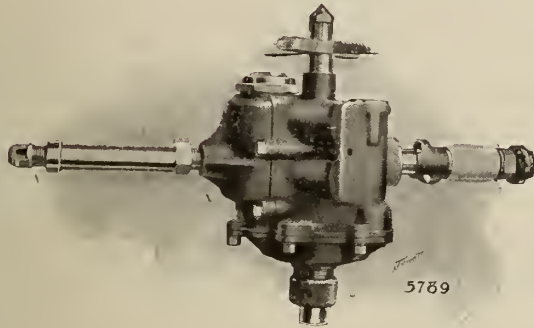


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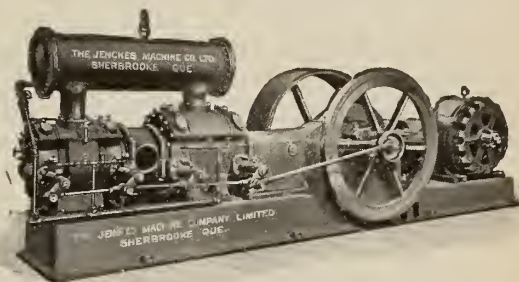
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## Synopsis of Coal Mining Regulations



**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal subdivisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B. — Unauthorized publication of this advertisement will not be paid for. —58782.

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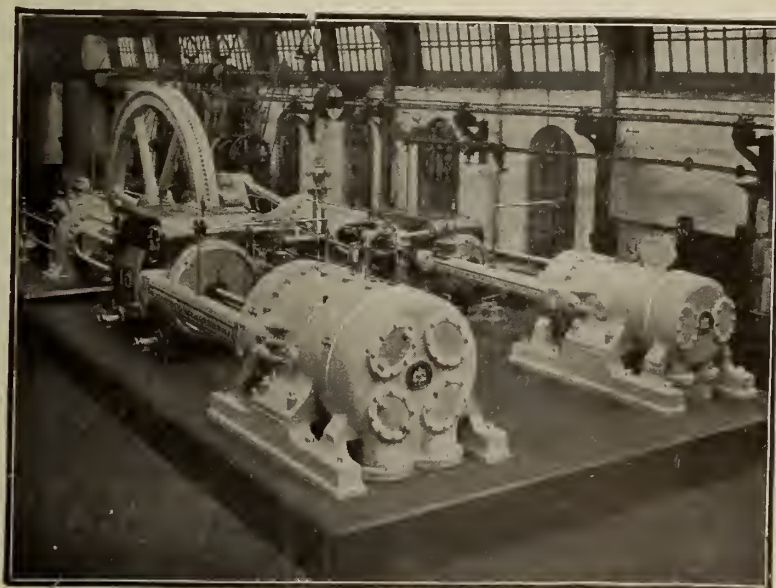
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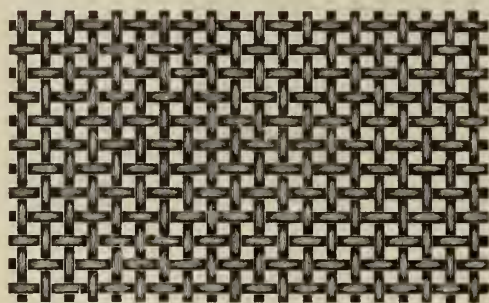
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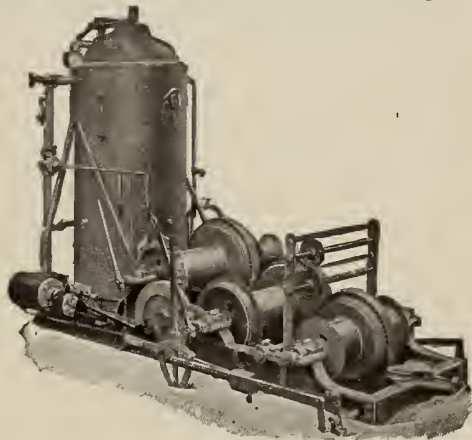
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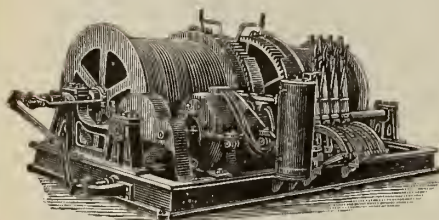
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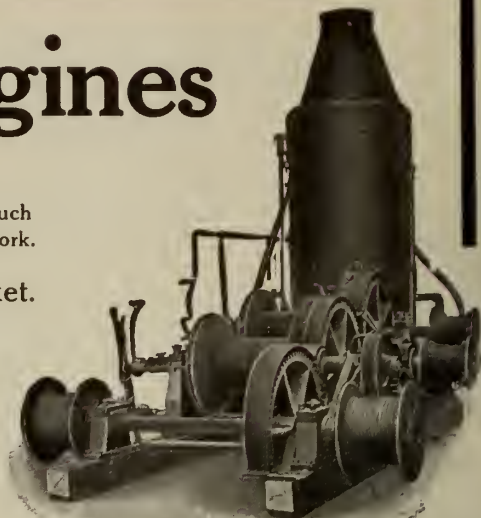
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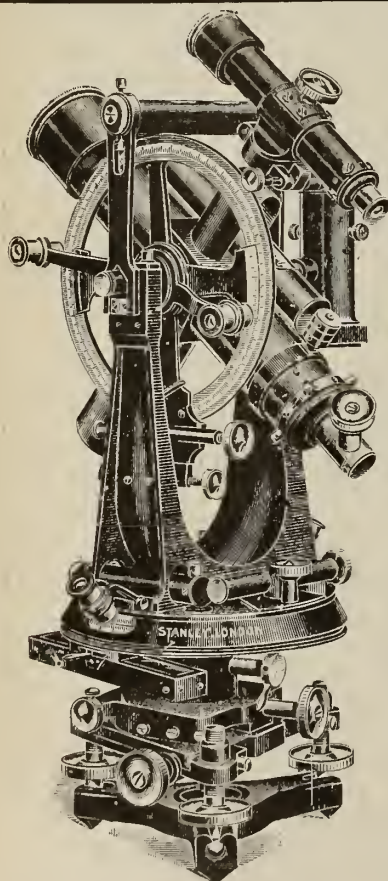


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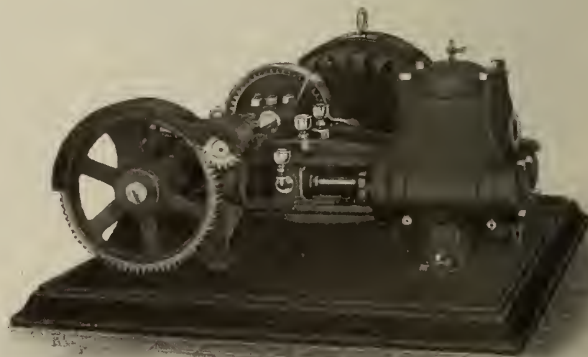
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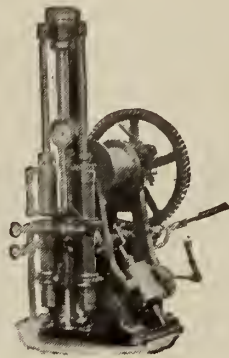
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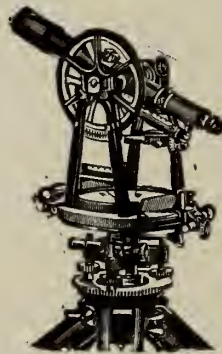
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| <p>Introduction.<br/>Deposition of Minerals.<br/>The Flow of Underground Waters.<br/>The Composition of Underground Waters.<br/>The Chemical Work of Underground Waters.<br/>The Origin of Underground Water and its Dissolved Substances.<br/>The Spring Deposits at the Surface.<br/>Relations of Mineral Deposits to Mineral Springs.<br/>Folding and Faulting.<br/>Openings in Rocks.<br/>Form, Structure and Texture of Mineral Deposits.<br/>Ore Shoots.<br/>Classification of Mineral Deposits.<br/>Deposits Formed by Mechanical Processes of Transportation and Concentration: Detrital Deposits.<br/>Deposits Formed by Chemical Processes of Concentration in Bodies of Surface Waters.<br/>Deposits Formed by Evaporation of Bodies of Surface Waters.</p> | <p>Deposits Formed by Processes of Rock Decay and Weathering.<br/>Deposits Formed by Concentration of Substances Contained in the Surrounding Rocks by Means of Circulating Waters.<br/>Deposits Formed by Regional Metamorphism Formed by Zeditisation.<br/>Deposits of Native Copper in Basic Lavas.<br/>Lead and Zinc Deposits in Sedimentary Rocks in their Genetic Connection with Igneous Rocks.<br/>Deposits Formed Near the Surface by Ascending Thermal Waters and in Genetic Connection with Igneous Rocks.<br/>Deposits Formed at Intermediate Depths by Ascending Thermal Waters and in Genetic Connection with Intrusive Rocks.<br/>Veins and Replacement Deposits Formed by Hot Ascending Waters at High Temperature and Pressure and in Genetic Connection with Intrusive Rocks.<br/>Deposits Formed by Processes of Igneous Metamorphism.<br/>Mineral Deposits of Pegmatite Dikes.<br/>Mineral Deposits Formed by Concentration in Molted Magmas.<br/>Metamorphosed Deposits.<br/>Oxidation of Metallic Ores.<br/>Calculation of Analysis and Representation by Diagrams</p> |
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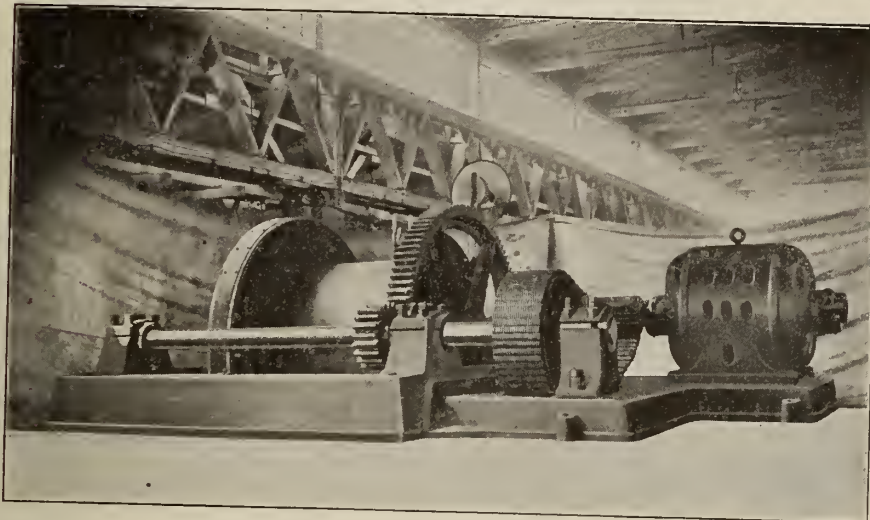
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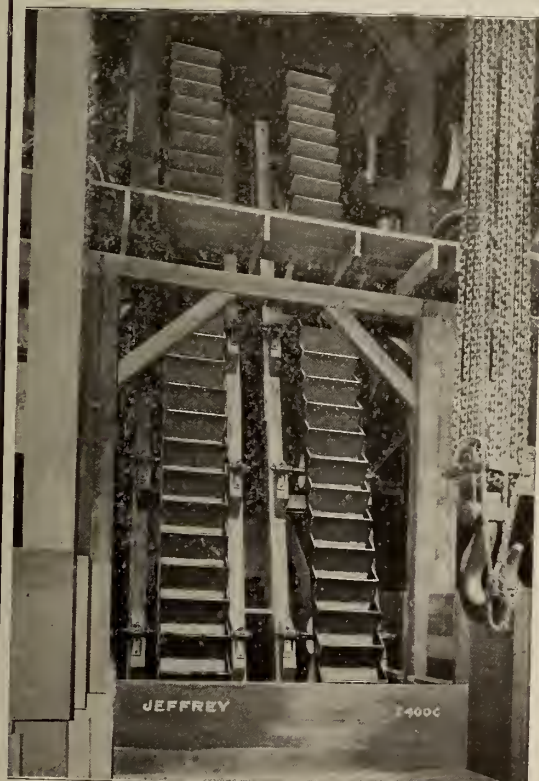
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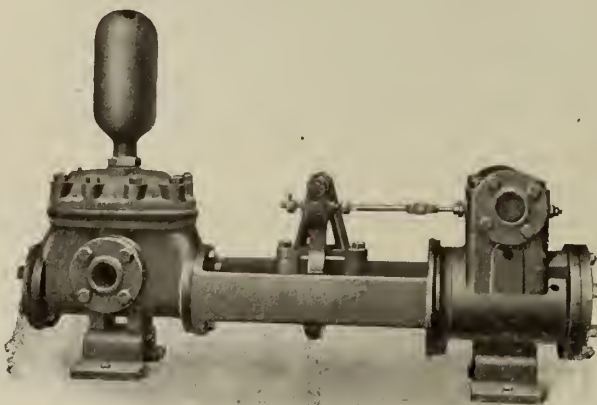
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# THE CANADIAN MINING JOURNAL

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## The Canadian Mining Journal

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REGINALD E. HORE

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## THE WAR AND ITS EFFECTS ON MINING

Suddenly and all unexpectedly the States of Europe have plunged into deadly warfare.

Austria considering herself wronged by Servia made several demands upon the Serbs. Servia agreed to some of Austria's demands, but refused to comply with others. Thereupon Austria took steps to punish her little neighbor. As a result came protests from Russia. In turn Germany protested against Russian mobilization. Soon all four nations were at war.

Germany proved to be ready to strike immediately. Not only Russia, but France also was invaded. The neutrality of Luxemburg and Belgium was not respected, as the Germans wish to cross Belgium to invade Northern France. Belgium protested and drew upon herself the wrath of Emperor William.

While evidently willing to wage war on France and Russia and the little States which barred the way to France, Germany showed some desire to avoid declaring war on Great Britain. According to the announcement of Earl Grey, Germany promised not to attack the north shore of France if Great Britain would remain neutral. Naturally Great Britain declined to make such an agreement. The occupation of Belgium by the German troops proved that any such agreement would have been very unwise.

Great Britain protested against Germany's breaking of the treaty which provided for the neutrality of Belgium. Germany refused to be restricted by the terms of the treaty. And so we are at war.

The series of events has taken such a brief time that it is yet impossible to understand what it all means. Some things are clear. A disaster that is likely to prove the greatest in history is upon us. The lives of thousands of men will be lost on the field of battle. Thousands will be wounded. Millions will suffer from lack of food and other necessities. These things will happen even if by some fortunate but unseen means the war is soon brought to an end. As long as the strife continues the waste goes on.

In the financial world all is uncertain. Fortunately prompt action stayed a panic which began with the announcement of war, and which was ruinous to many in the few days that the exchanges remained opened. We are assured that our leading bankers have the situation well in hand and that the governments of English-speaking countries will be able to handle the emergency which has arisen. It may prove that the financial stringency of the past year has done as much as anything to help trade during the coming months, by having placed financial institutions in a strong position.

That the war will interfere with mining operations is to be expected. So far, however, the indications are that comparatively few Canadian mines will be closed down in the near future. Gold mining should be one of the most attractive industries in these troublous times. The market for silver is somewhat uncertain and the price is likely to vary greatly. It is probable, however, that the companies will venture to increase their stocks somewhat while awaiting developments. There should be a good demand for nickel. Copper has shown the greatest weakness and many United States producers are cutting down their output to one-half. Much of the copper produced in Canada is obtained from ores containing nickel or gold. The market for these metals being good, there will likely be considerable copper produced. The market for asbestos, in spite of General Sherman's admonition that "War is Hell" has not been good since war was declared. As most of our asbestos goes to the United States the market will depend largely on the state of trade in that country. Coal will be necessary as in times of peace, and the coal mines will continue to make large outputs.

The buyers of silver are at present out of the market and say that the price must come down. On the other hand the producers claim that silver will be used for coinage and that the price will go up. It is to be hoped that the producers are right.

While there will be much demand for nickel the market for it is not sure to be a good one, owing to the difficulty of making deliveries of nickel steel from the United States. The Mond Nickel company which treats its matte in England is likely to be kept very busy, but the International Nickel Co. has discharged several men.

---

## OIL COMPANY PROMOTIONS

The public has refused to be taken in by the promoters of Calgary oil companies. In Calgary the citizens have contributed enough money to test the fields. They will not, however, find the market for shares very good. The invasion of the East by stock salesmen has failed. The industry has therefore a chance to be developed on its merits.

While many organizers of companies are disappointed with the reception accorded their glowing advertisements, they have only themselves to blame. The field has yet to be proven and any attempt to raise money by claiming that success is certain deserved to fail. At the time of our visit to the field, about a month ago, oil had only been found in one well, and yet four hundred companies had been organized and trading was in progress on four stock exchanges.

In contrast with the excitement at Calgary the scenes at Okotoks were pleasing. There was evidence that some of the money raised is being used to explore the field. Car loads of oil well supplies were on the sidings and workmen were loading wagons to be drawn

across the prairie. The citizens of Calgary may not be able to dispose of their shares at a profit to outsiders without proving their value; but they will themselves reap the benefit if oil is found in large quantities.

This is as it should be. A sufficiently large number have invested in an enterprise known to be venturesome. Further appeals for support should not be made until it has been shown that the money already raised is being wisely expended. Then appeals may be expected to be listened to.

---

## A PROSPECTORS' HAND-BOOK

The Geological Survey of Canada has issued the first of what promises to be a very useful series of handbooks for the prospector. This is a neat little booklet of twenty-six pages containing notes on radium bearing minerals by Wyatt Malcolm. There has been recently a great demand for information concerning the radium ores and the booklet meets this want.

Mr. Malcolm describes the uranium minerals from which radium is derived and the tests by which they may be recognized. He gives brief descriptions of the more important occurrences of uranium minerals in Portugal, Colorado and Utah, U.S.A.; Cornwall, Eng., and Joachimsthal, Bohemia. The places in which radium-bearing minerals have been found in Canada are: Madoc, Ont.; Mamainse, Ont.; Maisonneuve, Que.; Murray Bay, Que.; Snowdon, Ont.; Villeneuve, Que., and Wakefield, Que.

Up to date no important deposit has been found in Canada. The little booklet may assist some one to discover radium. The enterprise of the Geological Survey is therefore to be commended.

---

## UNIT CONSTRUCTION COSTS

A paper containing a great store of useful information for metallurgists has been prepared by Mr. E. Horton Jones for presentation at the Salt Lake meeting of the American Institute of Mining Engineers. The data derived from the building of the Arizona Copper company's smelter at Clifton, Arizona, is given in great detail. In Chapter I—Unit Costs, are to be found the most elementary total unit costs which the accounts provide for. In Chapter II—Comparative Costs—these elementary costs have been classified, averaged and reported as labor and material unit costs. In Chapter III—Composite Costs are given. They are unit costs built up from several elementary units, and likewise units of larger dimensions and simpler application, valuable for checking estimates and obtaining approximations of total costs. In Chapters IV, V and VI are given the Wage Scale Material Prices, and a description of the conditions surrounding the making of every elementary unit cost, which will enable the estimator to judge of their use under



any circumstance. These unit costs are actual ones made in a period of two years. The paper contains cost sheets of all phases of the work and scores of detail drawings.

It is very very seldom that a company gives out such information as is contained in Mr. Jones' paper. It is a good sign that there is now a greater tendency to make public such valuable data. In this respect the copper metallurgists have long been in advance of others. It is not a mere coincidence that such great progress has been made in the metallurgy of copper.

## FOREIGN WORKMEN IN THE MINES

Many of the miners now in Canada and the United States are Europeans. In some mines a large proportion of the working force is made up of men who are natives of the European countries now at war. Many of these men have already been called home and others are subject to call. More or less disorganization of the working force is sure to follow.

Some of the miners are Austrians, Hungarians or Germans. Many of them are well pleased with conditions in America and out of sympathy with the military madness of Germany. They are displeased with the prospect of having to leave their profitable employment to answer the call of the war lord; but many will go back, if they can, believing it to be their duty. Naturally the Canadian Government will not facilitate the transportation of men who return to fight against Great Britain. It would be perhaps advisable to afford these workmen an opportunity of declaring whether or not they are willing to remain here as peaceable citizens.

There can be little doubt that among the workmen there are a few who are quite in sympathy with Germany's war plans and who will do what they can to damage property or otherwise harm the country. Against these it is well to be on guard. It is to be hoped that nothing will occur to prove that the precautions already taken by the government are necessary.

Many of the workmen are natives of countries which are allies of Great Britain. These men will be given every facility to return home if they wish to assist in the defence of their countries against German invasion. They should be given first consideration when men are wanted after the war is over.

The war crisis has brought out a number of fine examples of Canadian patriotism. Hamilton Gault has offered to raise a regiment of infantry to the extent of 1,000 men all of whom have seen active service previously. This regiment will likely be known as Gault's Light Infantry, just as at the time of the Boer war another regiment was known as Stratheona Horse.

## YE MARINERS OF ENGLAND

Ye Mariners of England  
That guard our native seas!  
Whose flag has braved a thousand years,  
The battle and the breeze!  
Your glorious standard launch again  
To match another foe;  
And sweep through the deep,  
While the stormy winds do blow!  
While the battle rages loud and long!  
And the stormy winds do blow.

The spirits of your fathers  
Shall start from every wave—  
For the deck it was their field of fame,  
And Ocean was their grave:  
Where Blake and mighty Nelson fell  
Your manly hearts shall glow,  
As ye sweep through the deep,  
While the stormy winds do blow!  
While the battle rages loud and long  
And the stormy winds do blow.

Britannia needs no bulwarks,  
No towers along the steep;  
Her march is o'er the mountain-waves,  
Her home is on the deep.  
With thunders from her native oak  
She quells the floods below,  
As they roar on the shore,  
When the stormy winds do blow!  
When the battle rages loud and long,  
And the stormy winds do blow.

The meteor flag of England  
Shall yet terrific burn;  
Till danger's troubled night depart  
And the star of peace return.  
Then, then, ye ocean-warriors!  
Our song and feast shall flow  
To the fame of your name,  
When the storm has ceased to blow!  
When the fiery fight is heard no more,  
And the storm has ceased to blow.  
—Thomas Campbell.

## COPPER QUOTATIONS.

The refusal of the Engineering and Mining Journal to name copper quotations since the first of August has caused considerable comment and criticism among producers. Copper men cannot recall when such a step was taken before.

The Boston News Bureau knows of transactions in electrolytic during the past week at from 12¾ cents, delivered 30 days, down to 12½ cents cash. Transactions were also effected at 12⅝ cents cash, and 12⅝ cents, delivered 30 days.

The bulk of this business was done in car lots, but there were individual transactions calling for shipment of 500,000 pounds of copper. Delivery for the most part was for August and September, but some October sold at the higher prices.

Inquiry of the Engineering and Mining Journal as to the refusal of that publication to quote daily prices since Aug. 1 brought forth the reply that "retail lots have not been used by us in compiling averages for the past 15 years."

It was called to the attention of the Engineering and Mining Journal that all producers were not con-

sulted each week in the compilation of the averages in question, to which the reply was "We see only those producers who let us inspect their books."

Two of the selling agencies, the American Metal Co. and L. Vogelstein & Co., it is understood, transact much if not all of their business on the basis of the Engineering and Mining Journal averages. They take in copper from the mining companies at these figures.

### THE U. S. BRASS INDUSTRY.

According to the Thirteenth Census, in 1909 there were in the United States 1,021 firms that dealt mainly in brass and bronze. This total included jobbing foundries, manufacturing plants that both cast and machine a brass or bronze product, and rolling mills, but did not include iron foundries having nonferrous departments nor the numerous large brass-foundry departments of manufacturing plants that produce the castings used in the manufacture of electrical apparatus, cash registers, pumps, and the thousands of machines that require brass castings for their construction. Penton's Foundry List for 1910 gives about 1,150 exclusively nonferrous foundries and about 2,300 iron or steel foundries that also melt brass. If the rolling mills and jobbing foundries in manufacturing plants be included, and if due credit be given to the rapid growth of the industry in the last few years, largely through the stimulation of the automobile business, it is probable that not less than 3,600 plants are to-day melting brass or bronze.

The plants vary in size from the small shop using only one small furnace and employing only one or two molders to vast concerns melting ten, twenty, or even fifty million pounds of copper alloys a year. The alloys employed and their uses are legion, and the castings produced vary from tiny pieces weighing only a fraction of an ounce, such as buckles, up to huge 10-ton propellers for ocean liners.

### FULLER'S EARTH.

Fuller's earth is a variety of clay that has high capacity for adsorbing basic colors and can remove these colors from solution in animal, vegetable, or mineral oils, as well as from some other liquids, especially water. It is valuable when its adsorptive powers are strong enough to permit it to compete actively with fuller's earth already accepted as of standard quality for refining oils.

Analyses of various samples of fuller's earth vary so greatly that chemical analyses are now well understood to be no criterion whatever in determining whether or not a particular clay shall be classified as a fuller's earth. Like all other clays, fuller's earth is a hydrous, aluminum silicate containing small proportions of other substances. Most fuller's earths contain a higher percentage of water of composition than most clays, but this water is not an essential factor in the bleaching properties of all fuller's earths; some bleach fully as well after it has been driven off as before, and others lose much of their bleaching power when this water is removed.

### FELDSPAR.

According to F. J. Katz, of the U. S. Geological Survey, the marketed production of feldspar in the United States in 1913 was 120,955 short tons, valued at \$776,551. Both in quantity and in value this was the larg-

est recorded annual production. Each important producing state—California, Connecticut, Maine, Maryland, New York, North Carolina and Pennsylvania—showed an increase in both quantity and value. During the year about 50 quarries marketed feldspar. Ten of them were new producers. Notwithstanding the increase in quantity and the production from new sources the average price per ton of the total production was higher than in any other year. The average price per ton of the combined crude and ground output was about 25 cents more than in the best preceding year (1911). The prevailing prices f.o.b. quarries for crude material were about the same as in previous years, but the average price f.o.b. mills of ground feldspar was considerably higher (10 to 12.5 per cent.), than in recent years. The feldspar market appears therefore to have been unusually strong and to have consumed an increased production at a rising price. The year should have been a profitable one for the feldspar grinders.

### THE SOLIDIFICATION OF METALS.

According to a report presented by Cecil B. Desch at the annual general meeting of the Institute of Metals, held in London on March 18th, 1914, the arrangement of crystal grains in a metal or alloy has usually been accounted for by growth of crystallites from independent centres. Against this, Quincke has proposed the hypothesis of foam-cells. On this view, the liquid separates, immediately before crystallizing, into two liquids, which arrange themselves to form a foam, and crystallization then takes place within the foam-cells. Quincke has applied the hypothesis to the explanation of many of the properties of metals. Several recent writers have also sought to connect the cellular structure with the prismatic partitioning of cooling liquids by convection currents. Whilst this arrangement may possibly be traced in some metals when cast in thin sheets, it cannot account for the structure of ingots or other large masses. The passage of metals in certain cases through an intermediate liquid-crystalline state has also been assumed, but not yet established. A review of the existing evidence suggests that several distinct cellular structures have often been confounded, and that a common origin has been assumed for structures which have a merely geometrical similarity.

### INTERNATIONAL NICKEL.

The International Nickel Co. has made considerable curtailment of working forces at its mines at Copper Cliff, Ont., and at its plant at Constable Hook. This is usually a dull season with the Nickel Co., but the war in Europe with the resultant tie-up of shipping has brought about unusual dullness.

Creusot steel works presented to the French government 26 complete batteries of 105-millimetre guns ordered by a foreign government just before the war. The company informed the government that it stood ready to pay indemnity. The gift represents a value of more than \$3,000,000.

The United States treasury has ordered San Francisco mint to buy 200,000 ounces of silver at 51½ cents an ounce, hoping to partly relieve conditions as affected by European war.



# METHODS OF WORKING A THIN COAL SEAM AT JOGGINS, NOVA SCOTIA

By C. H. McL. Burns.

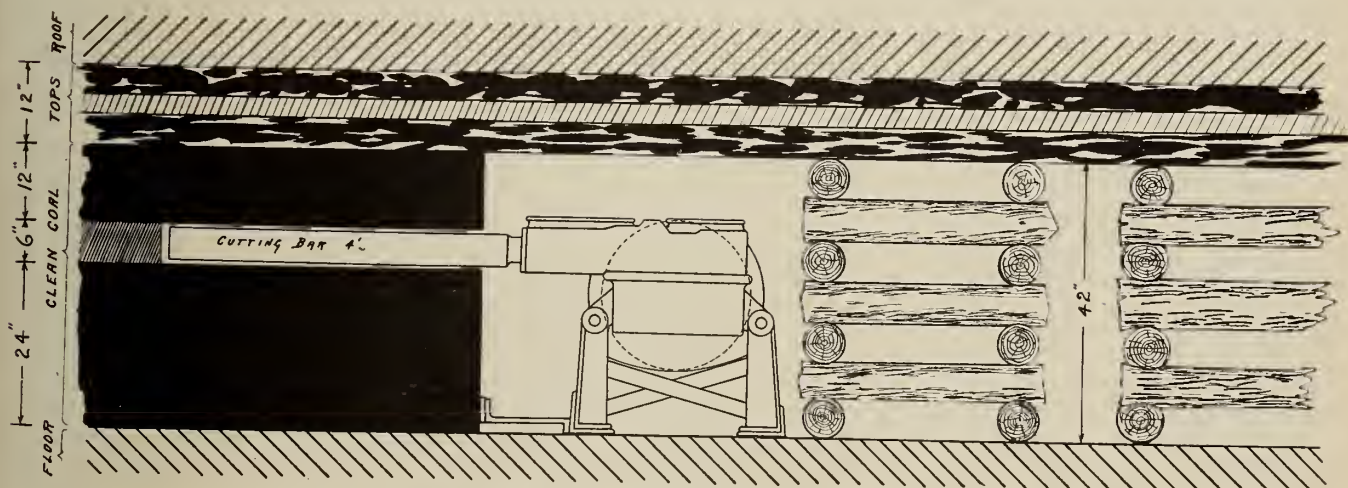
Although the history of coal mining in the Joggins area of the Cumberland coal field, like that of Cape Breton, dates back to the first settlement of the country by the French, the development of this field has been insignificant when compared with the latter. This inactivity can be attributed to a number of causes; but there is no doubt but that the chief of these has been the difficulty of profitably mining the thin seams of this basin by ordinary methods.

The Joggins area lies in the northwestern part of the country. The coal seams occur very regularly along the northern side of a synclinal basin of carboniferous measures for over twenty miles, showing on the shores of Cumberland basin a remarkable section in which between seventy and eighty seams are exposed. These are all comparatively thin, however, running from half an inch to five feet thick. Only about six

on what is generally known as the "Joggins Main Seam." In Dawson's section of the shore he gives the thickness of this seam as follows: Coal 3 ft. 6 in., clay 1 ft. 6 in., coal 1 ft. 6 in. The outcrop on the shore was all worked out at this time, and the section must have been taken in one of the pits further east, where in places the clay thinned to six in. and the coal thickened to 6 ft. In the present mine, which is situated on the cliffs, the clay parting is nearly 20 ft. thick, and only the top seam is worked.

The coal dips south 25 deg., west 17 deg. The present slope is driven parallel to a fault 4,000 ft. to the eastward, and runs a little west of the line of dip, across the coal, giving the slope a pitch of 15 deg. 30 min., and keeping the east levels a uniform length.

The main slope, main hoisting slope and fan slope are parallel, with 50 ft. pillars between them. They



can be considered workable. The six seams range from 30 in. to 5 ft. in thickness on the shore. Further inland two of these can sometimes be worked together, giving from 6 to 9 ft. of coal with a clay parting.

The first mining was carried on in the cliffs, and on the shore at Joggins, where the tide of the Bay of Fundy exposes the outcrops for nearly half a mile at low water. Later small pits were opened near the shore, but no attempt at systematic mining was made until the General Mining Association came into the field in 1827. During the Civil War in the United States, and in the years of reciprocity with that country, a number of small mines were opened on several of the seams at different Points. The loss of the United States market seems to have discouraged most of the operators. Since then, however, mining operations have been carried on at Joggins, River Hebert and Chignecto almost continuously. One company followed another with but indifferent success. None of the mining was deep. One slope after another was opened along the outcrop; long underground hauls making the cost of production prohibitive.

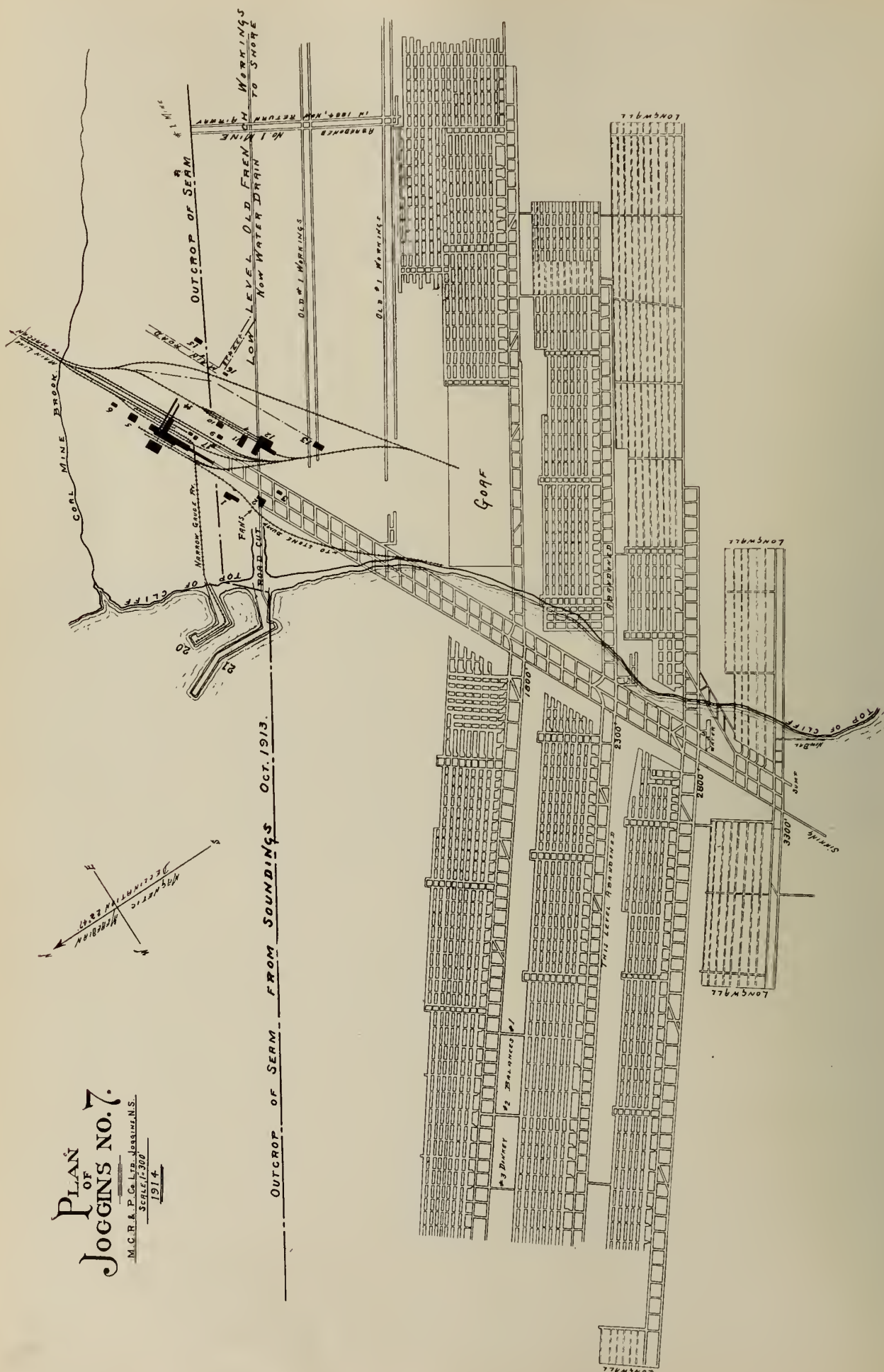
At Joggins practically all the openings have been

were driven 300 ft. through old workings, and cross the shore line 1,000 ft. from the surface. Levels were run east and west at points 1,800 ft., 2,300 ft., 2,800 ft. and 3,300 ft. down the slope.

The mine was worked on the room and pillar system, the coal being mined to the rise of each level for a distance of 400 ft., thus leaving a pillar between each lift and dividing the mine into sections or panels. On the west or submarine side of the two top lifts about 60 per cent. of the coal has been left in the pillars. Below the 2,300 ft. level the cover is thick enough to allow of all the coal being removed. Horse haulage was used on all of the levels.

In a seam of this thickness the distance between the main slope and the working places rapidly increases, necessitating the upkeep of long and expensive levels, especially where horse haulage is used and the roads have to be brushed to get height. To solve this problem the company has installed mechanical haulage in some levels and abandoned others.

For mechanical haulage the levels need only be brushed and kept timbered high enough to allow the boxes to pass. This alone means a big saving; but the



PLAN  
OF  
JOGGINS NO. 7.  
M.C.R. & P. CO. LTD. JOGGINS, N.S.  
SCALE 1/300  
1914

OUTCROP OF SEAM FROM SOUNDINGS OCT. 1913.

Plan of Joggins No. 7 Mine, Nova Scotia



greatest advantage is that the capacity of one road is so greatly increased that fewer are needed. So with the introduction of mechanical haulage on the 1,800 ft. level, the 2,300 ft. level was abandoned, and the coal is now worked from this lift by downhill heads from the 1,800 ft. level. These heads or "donkey balances," as they are called here, are kept about 400 ft. apart, and the coal is trammed from the face to the head by the loaders, where it is hoisted to the 1,800 ft. level with electric donkeys. The donkeys are 25 h.p. and handle about eight or nine boxes. This system has also been adopted on the 3,300 ft. level, and the slope will be sunk to the 4,300 ft. level before the next levels are broken off, making the lifts a thousand feet apart instead of 500, as formerly, with the coal worked to the rise and dip of each.

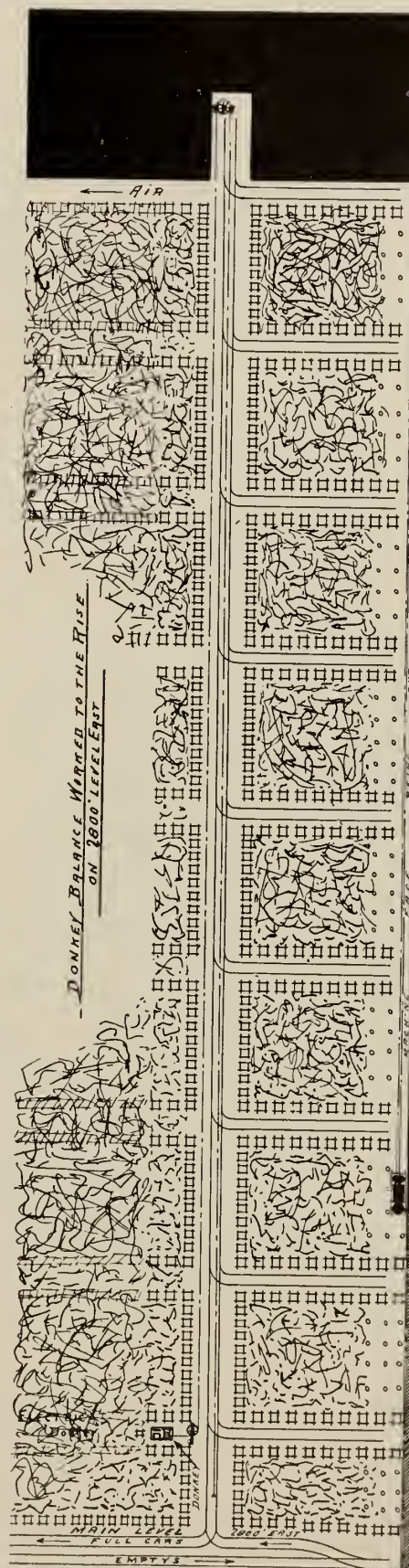
On levels which are comparatively straight, endless haulage has been adopted, and on others, where conditions are less favorable, main and tail is used. Both systems give good satisfaction; but the endless is probably the most satisfactory where it can be used. The rope runs continuously, but it can be stopped anywhere, signal wires running along the levels. Cars can be put on and taken off at any turnout without stopping the rope, and can be attached to the rope singly or in trips. Due to its continuous service a large capacity is maintained at a comparatively slow speed, thus saving both road and cars.

The 1,800 ft. and 2,300 ft. lifts are still worked room and pillar, but on the 2,800 ft. and 3,300 ft. lifts long-wall has been adopted. Mavor and Coulson electric bar machines are used. The first machine was started on the 2,800 ft. level east in 1911. There are four working at present, with two more ready as soon as places are available for them.

The machine starts at the level, or bottom bord of a downhill balance, and cuts uphill a distance of three hundred and fifty feet or three hundred feet, mining about one hundred and eighty tons of coal a shift. The accompanying sketch gives the general layout of a machine balance, which is practically the same whether worked to the rise or dip. The only difference is that, in working to the rise the electric hoisting donkey is placed at the bottom, and in working to the dip it is placed on the level above. This keeps the motor in the main airway. Bords or gateways lead from the balance to the face. They are about 30 ft. apart and are only brushed high enough to clear the boxes, removing the 1 ft. of top coal being sufficient in most cases. As the machine cuts up the face, butts are built at the bords and props set between, close to the face. The machines here overcut in a soft band of good coal. The tops are wedged down and the bench shot with bulldog powder and squibs.

The mine is not very gasy and is damp, requiring no sprinkling. Ventilation is supplied by a Capel fan, direct connected to a 95 h.p. electric motor and an auxiliary steam driven Sturtevant fan. The Main Haulage slope, Man slope and old Number One mine serve as return airways. This keeps these roads free from ice in winter. Thirty thousand cubic feet of air with a 2 in. water gauge is delivered per minute.

The main slope is equipped with endless haulage as far as the 3,300 ft. level, and has a capacity of 1,000 tons per eight hour day. The output at present runs from 500 to 750 tons. The rope is run by a slow speed tandem engine, 18 x 36. The coal is being hoisted at present from the sinking by a small electric hoist, but a 250 h.p. electric, endless haulage is being installed at





the 3,300 ft. level, and will handle the coal from here down as the mine is developed.

The power plant is situated at the company's Chignecto mine, 15 miles from Joggins. Here 2,800 h.p. is generated from culm burned under Robb-Mumford boilers. The boilers are fitted with Jones underfeed stokers and a forced draught. The coal is brought direct from the bank-head with a Jeffrey dick conveyor to the pockets over the fire doors. The feed water entering the boilers is at a temperature of about 121°F.

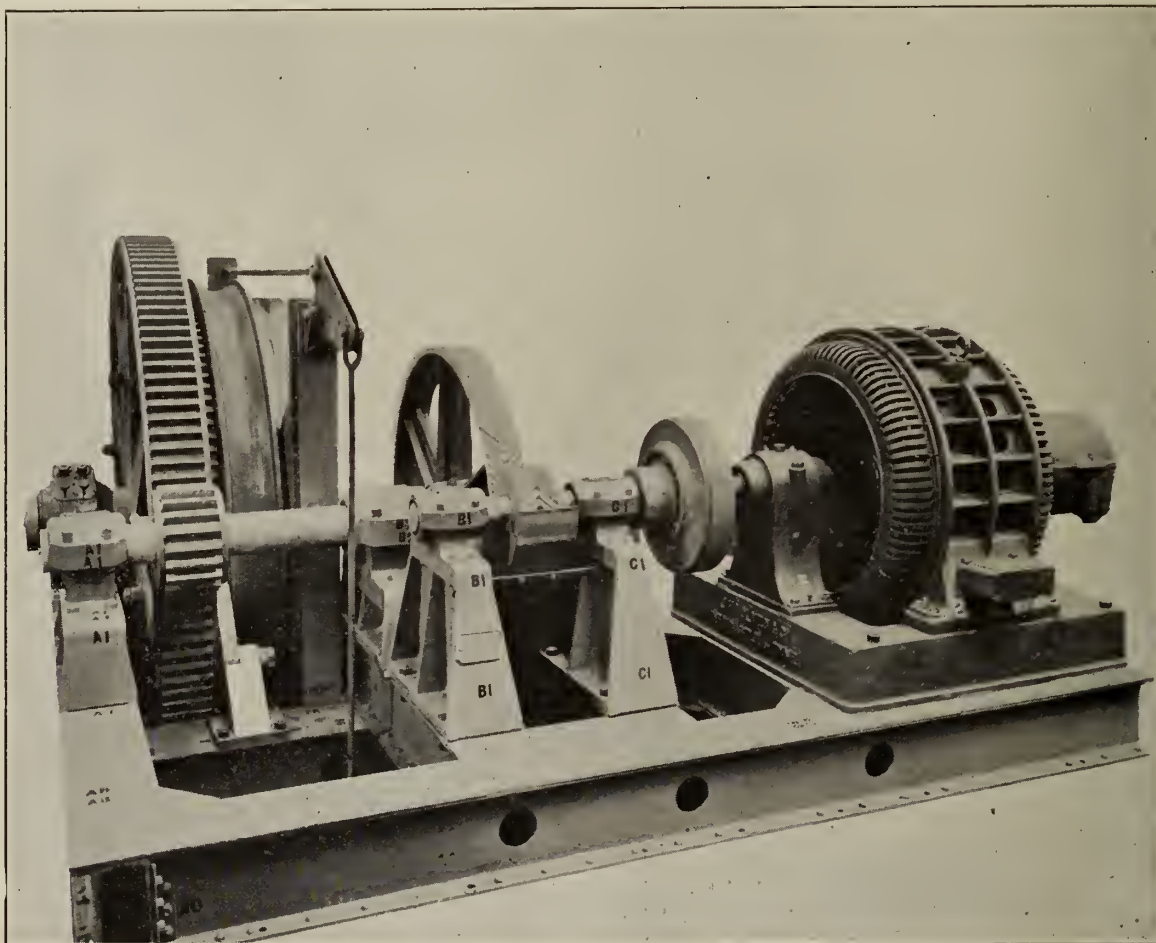
There are three units in the engine rooms. Two 500 kw. 11,000 volt generators, direct connected to Robb-Armstrong, vertical, inclosed, high speed, compound engines and one high pressure steam turbine driven generator of 1,000 kw. capacity.

The current is transmitted to the sub-station in Joggins at 11,000 volts, where it is stepped down to 2,200

The transformers are oil cooled and have a much larger capacity than the peak load, and as the air here is always cold and direct from the fan slope there is very little risk from fire. The loss on a line 2,800 ft. long is considerable and as the mine is developed the high tension line will be carried down.

The main lines from here are carried in the haulage roads. Three rubber covered double braided stranded conductors, tied to glass insulators with tarred marlin, are carried on the props by ordinary side pins. The pins are nailed to the props and will readily pull off before the wire breaks in case of a fall. Leather and canvas suspenders and long wooden cleats were previously used; but none of these methods have proved as satisfactory here as the present one.

At each head or balance an armored cable laid along



**New Endless Haulage for 3300 ft. Lift, to Operate on Main Slope Below 3300 ft. Level**

volts. The motors on the surface run at this voltage, and a line runs down the fan slope to a small sub-station at the 2,800 ft. level, where the voltage is again stepped down to 220 volts for distribution throughout the pit.

The air slope only comes within 300 ft. of the outcrop, where a water drain (the low level of the old workings) runs out to the shore. A shaft connects the slope here with the fans on the surface, and although the shaft is wet the slope is comparatively dry. A lead covered paper insulated cable runs down the shaft; but is replaced at the bottom by three solid rubber covered double braided wires, carried on glass insulators on two cross arms at one side of the slope, down to the sub-station at the 2,800 ft. level.

the roadbed leads from the main line to a gate-end switch, usually situated in a bord about half way up the balance, and from here the trailing cable leads to the machine at the face.

Two direct coupled, motor driven turbine pumps are used in the sinking and pump to the 3,300 ft. level. The water is pumped from a lodgment here to one at the 1,800 ft. level by an electric pump of the same type with a capacity of 100 gal. per minute. A three throw ram pump of 125 gal. per minute handles the water from here to the surface.

The pump and endless haulage motors are of the short circuited rotor type. On the hoists, coal cutters and main and tail haulage, where a variable speed is



required, machines with the wound rotor and slip rings are used.

Electric lights are used on the main slope, at the landings of the balances and in the pump and hoisting motor houses.

The electrification of this mine has placed it on a profitable basis, and will admit of a much larger development of the submarine areas than would otherwise have been possible. Although the machine coal costs almost as much at the face as that from the hand picks, the output is very much larger per man employed underground. The large output cuts down haulage costs and the machines save considerable office expense over hand picks with the same capacity, so that the coal is landed on bank at a greatly reduced cost per ton.

There is no doubt that where conditions are favorable the great flexibility of the equipment makes electricity the ideal power, especially in submarine workings where power will have to be transmitted long distances from the supply, and in thin seams such as this where cramped working conditions prevail.

### MINING OPERATIONS IN QUEBEC, 1913.

The Department of Colonization, Mines and Fisheries of the Province of Quebec, has issued a report by Theo. C. Denis, Superintendent of Mines, on the mining operations, mineral production, and geological field work of the Province of Quebec during the calendar year 1913. A preliminary statement by Mr. Denis was given out in February, and published in the Canadian Mining Journal. The present report supersedes the preliminary statements, and gives final figures.

According to the revised report the value of the products of the mines and quarries of Quebec reached a total of \$13,119,811 during the year 1913. It is the highest annual production recorded to date, and exceeds that of 1912 by \$1,932,701. Since 1904 Quebec has shown an unbroken series of increases of each year over the preceding one. In ten years the mineral production of the province has been more than quadrupled. Compared with 1912 Quebec shows a higher proportional increase than any of the other provinces.

During 1913 no geologists were working at the regular field work, owing to the International Geological Congress then taking place in Canada. Late in the season Dr. J. A. Bancroft began an investigation of the copper deposits of Weedon and Stratford townships.

The report contains a statement on accidents in mines.

Under the heading of Mining Operations an account is given of the asbestos industry and the copper and sulphur ore industry. Dr. Bancroft presents a preliminary report on some copper deposits of the Eastern Townships. Notes are given on gold, silver, iron, chromite, graphite, lead, zinc, ochres, mica, kaolin and structural materials.

A useful feature of the report is a list of the principal mineral producers in the Province of Quebec.

A considerable proportion of the report is devoted to a description of the excursions of the International Geological Congress, and to geological descriptions of some of the areas visited on those excursions.

### BUILDING AND ORNAMENTAL STONES OF THE MARITIME PROVINCES.

For some years Dr. W. A. Parks, of the University of Toronto, has been preparing for the Mines Branch, Ottawa, reports on the building and ornamental stones of Canada. Vol. 1 of this report, containing general information on the industry and an account of the building and ornamental stones of Ontario was published some time ago.

Vol. 2, building and ornamental stones of the Maritime Provinces, has just been issued by the Mines Branch. Like the preceding volume, it is well printed and well illustrated, containing several colored plates. In the preparation of this report, Dr. Parks visited about 60 quarries as well as a considerable number of abandoned quarries and prospects. While the report is not confined to quarries in actual operation, it makes no pretence of including every opening that has been made for the production of building stone. It is thought, however, that every important district is represented by a typical example, and that every stone commercially available at the present time has received due consideration.

The various stones are treated according to the class to which they belong, eg., granite, sandstone, etc., and according to the more or less geographical areas into which the quarries naturally fall. In order to give prominence to the economic and commercial aspect of the work, the quarries are described under the name of the owner wherever possible.

The general plan of description of individual properties is: quarry observations, description of stone, economic remarks and statistics, examples of the use of the stone. Following the description of the various areas there is inserted a short summary to which the general reader, not desirous of detailed information is referred.

Several maps accompany the report. These are designed to show the general geology of the region, but more particularly to point out the location of the important quarries.

### THE PRE-CAMBRIAN GEOLOGY OF SOUTH-EASTERN ONTARIO.

The Ontario Bureau of Mines has issued a report by Dr. W. G. Miller and Cyril W. Knight, on the geology of a section of Ontario where several series of pre-Cambrian rocks occur.

Seven distinct areas were selected, which were considered to present the best conditions for the study of the characters and relation of the rocks. The areas lie in the counties of Peterboro, Hastings, Addington and Frontenac, within 30 or 40 miles of the north shore of the east half of Lake Ontario.

A geological map has been made of each of these seven areas. The maps range in scale from 800 ft. to one-half mile to the inch.

The region has received much attention from students of pre-Cambrian geology, and the recent work of Dr. Miller and Mr. Knight will be of interest to many who have endeavored to read the history of these old formations.

The conclusions arrived at by the authors are presented in the following summary:

"The chief results of our work are the following:

"1. It has been proved that rocks of Keewatin age, similar in character to those of northern Ontario and the Lake Superior region, occur in large volume in



southeastern Ontario. Heretofore it has been held by certain writers that Keewatin rocks do not occur here and that no basement for the Grenville sediments was to be found in this part of the Province. In some areas, rocks that in the past were called amphibolites, and were considered to be in whole or in part of sedimentary origin, are found to be more or less highly metamorphosed Keewatin lavas.

"2. The Grenville sediments have been classified and their relations determined. These sediments were deposited on the surface of the Keewatin lavas, and consist, normally, at the base of greywacke or quartzite, fine in grain, rusty schist (clay rock), and iron formation (banded chert or jaspilyte); the last named rock had not previously been recognized in southeastern Ontario. Although at times the sediments may be more or less mixed or interbedded, above those mentioned come crystalline limestone that is essentially magnesian, and finally crystalline limestone that is essentially non-magnesian. No unconformity has been observed within the Grenville.

"While it seems likely that erosion of part of the surface of the Keewatin preceded or accompanied the deposition of the Grenville sediments, an unconformity has not been proved to exist between the latter and the Keewatin lavas.

"It is also not unlikely that sedimentation and the outpouring of lava took place partly contemporaneously. Sediment, especially the finer fragmental material, from submarine lavas is difficult to distinguish, under conditions in which the Grenville rocks are now found, from land-derived sediment. It is believed by most authorities that clays and certain other materials in the deeper parts of the ocean are formed, by decomposition in sea water, from fragments of submarine lavas and from other inorganic material transported from a distance. If such sediments were submitted to the extreme metamorphism that the Grenville rocks have undergone, they would, in all probability, be indistinguishable from ordinary land-derived material.

"3. Granites of two ages have been recognized. The older of the two (Laurentian), which is gneissoid in character, intrudes both the Keewatin and the Grenville, but is older than certain pre-Cambrian conglomerates and other sediments of the region. The younger granite intrudes all the sediments. Granites of both ages are extensively developed, and, heretofore, they have not been differentiated as regards their age.

"4. Conglomerates and other pre-Cambrian fragmental sediments of the region were at one time grouped with the less highly metamorphosed, or blue, crystalline limestones, and the name Hastings was applied to them. We place most of the blue limestones in the Grenville and restrict the name Hastings to the conglomerates, with some limestones, and other sediments that we have proved to be post-Laurentian in age. The Hastings rocks, as here defined, have been found at various places across a strip of country sixty-five miles in length, from the township of Belmont in Peterborough county on the southwest to the township of Palmerston in Frontenac county on the northeast. On following pages reference is made to the views that have been held concerning the Hastings and Grenville series.

"5. Intrusives, later in age than the Hastings sediments, are represented by gabbro with extrusive facies (basalt and tuff), and granite.

"6. The crystalline limestones and other Grenville sediments in southeastern Ontario constitute a series of great thickness, and are found to be of pre-Lauren-

tian age. The great volume of the sediments older than the Laurentian appears not to justify the separation of the Laurentian and earlier rocks from those of later pre-Cambrian age. In other words, a dual subdivision of the pre-Cambrian into an upper characteristically sedimentary group above the Laurentian and a lower igneous complex, including the Grenville, is not logical. Hence the writers do not make use of the terms Algonkian and Archean, or Proterozoic and Archeozoic, employed by many authors."

The conclusion of the authors that many of the rocks in this area are of the same age as the Keewatin rocks of northern Ontario and the Lake Superior region, should help geologists in comparing the geology of different pre-Cambrian areas in Ontario.

Apparently the very thick Grenville sediments occupy a position similar to that of some of the sedimentary rocks found with Keewatin lavas in northern Ontario.

### GRANBY.

Granby Consolidated Mining, Smelting & Power Co. will put into effect a drastic curtailment of production. This, in brief, will probably result in the cessation of operations at the old mine and smelter at Phoenix.

Efforts of the mine management will concentrate temporarily on operations at Anyox where the new Hidden Creek smelter has been in operation since the middle of last March.

Word has already been sent to the mine by the New York management to wire quickly the status of conditions and outlook for the immediate future. Upon receipt of reply in the East the old property will close its plant.

Insufficient labor and current copper market conditions led the directors to take the steps noted. Hungarians and Austrians constituted a large part of the working force, and with the outbreak of war hostilities they made preparations to go back to Europe.

The result was that the working force was reduced to a number that could run only one plant, and it was decided to keep the new smelter at Anyox in operation, as it could produce copper cheaper than could the Phoenix plant, and would, furthermore, give the mine management opportunity to tune the Hidden Creek furnaces up to capacity, grade and mixture of ores.

With copper metal below 13 cents, the Phoenix operations have not been showing much profit. The July cost is understood to have been reduced below 10 cents, but that was lower than usual.

On the other hand, the Anyox operations have been profitable almost since the first furnace blew in. At the moment all three furnaces are in operation at the new smelter, but capacity has not been reached.

June production of the old smelter was 1,757,560 lb. of copper, 36,452 oz. of silver and 3,431 oz. of gold.

Copper output of the two Granby plants has been as follows (lb.):

	Phoenix.	Anyox.	Total.
January. . . . .	1,793,840	.....	1,793,840
February. . . . .	1,661,212	.....	1,661,212
March. . . . .	1,775,852	.....	1,775,852
April. . . . .	1,692,102	440,767	2,132,869
May. . . . .	1,669,334	773,960	2,443,294
June . . . . .	1,757,560	949,035	2,706,595

No decision has yet been reached by the directors relative to the next dividend, but with the sudden disappearance of demand for copper and one half of its plant shut down, the board will have much to take into consideration before declaring another dividend.



# IMPORTANCE OF BORE-HOLE RECORDS AND CAPPING OF GAS WELLS

By W. J. Dick.

Mining Engineer of the Commission of Conservation, Canada.

Accurate records of bore-holes made on Crown lands in Canada have never been kept. Abandoned gas and oil wells, as well as test wells, are never marked, and, in time, all knowledge of their situation is lost. With the single exception of Ontario, no province even requires that such wells should be plugged. As a result, such bore-holes become sources of serious danger to those who may be, at a later date, exploiting other minerals in their vicinity. At the same time, the Governments are neglecting a valuable means of obtaining information with respect to the geology of the country.

It is the purpose of this paper, therefore, to show the necessity that exists for filing with the Governments concerned all records of bore-holes made on Crown lands in Canada. While special mention is made of wells drilled in prospecting for natural gas and oil, nevertheless the same arguments hold good, to a greater or less extent, with regard to holes drilled for other purposes such as prospecting for coal, water, salt, etc.

In Manitoba, Saskatchewan, Alberta, the North-west Territories, and in the Railway Belt and Peace River Block in British Columbia, mining rights are under Federal control, while in the other provinces they are subject to Provincial regulations. In Ontario, ample statutory provision is made to guard against the waste of natural gas and for the plugging of all abandoned wells, but no province requires the lessees of mining rights to file a record of the actual situation of bore-holes or logs of bore-holes showing the thickness and kind of formations passed through.

In the case of wells drilled for water, etc., for municipal purposes, it would be advisable for the Commission of Conservation to send a memorandum to all municipalities, pointing out the importance of obtaining the bore-hole records and advising them to require this information from the well-drillers as a part of the drilling contract.

For reasons, stated later, and on account of the activity in oil and gas prospecting in provinces in which mining rights are disposed of under Dominion regulations, it is necessary that provisions be made in those regulations covering the recommendations contained herein.

## Federal Regulations for the Disposal of Petroleum and Natural Gas Rights.

The following is a brief resume of the more important provisions of the Dominion Regulations for the Disposal of Petroleum and Natural Gas Rights.\*

1. The petroleum and natural gas rights, which are the property of the Crown, may be leased to applicants at a rental of twenty-five cents per acre for the first year, and fifty cents per acre for each subsequent year, the rental to be paid yearly in advance. The term of lease is twenty-one years, renewable for a further term of twenty-one years, provided the lessee can furnish satisfactory evidence to the Minister of the Interior to show that, during the term of the lease, he has complied fully with the conditions of such lease and with the

provisions of the regulations in force from time to time during the currency of the lease.

2. The area leased shall not be greater than 1920 acres and the length of the tract shall not exceed three times its breadth. No person shall be permitted to acquire a greater area except by assignment; provided that a person who has been granted a lease for location, and who subsequently abandons or assigns the same may, after the expiration of twelve months from the date of the lease apply for an area not greater than that abandoned or assigned, provided further that such rights shall not be granted unless all payments on account of rent or other liability to the Crown have been fully made.

3. The petroleum and natural gas rights do not include the surface rights, but provision is made for the acquisition of whatever area of available surface rights the Minister of the Interior may consider necessary for the efficient and economical working of the rights granted.

4. No application for a lease shall be accepted or recorded unless accompanied by the full amount of the rental for the first year.

5. If during the term, the lessee shall fail to pay rental in advance for each subsequent year, within thirty days after the date upon which the same became due, the lease shall be subject to cancellation at the discretion of the Minister.

6. Provided, that if the lessee, in consideration of the expenditure to be incurred in actual boring operations, makes application, at or before the beginning of the second and third years, respectively, of the term of the lease, for an extension of time for the payment of rental, the Minister may grant such extension in writing; and if the lessee, before the end of the year in respect of which application was made, submits evidence to the Land Agent of the district that at least \$2,000 has been spent on actual boring operations, the amount expended, exclusive of the cost of machinery and casing, may be deducted from the rental.

7. Within one year from the issuance of the lease, prospecting machinery of the value of at least \$5,000 shall be installed.

8. Within fifteen months, the lessee shall commence boring operations and if he ceases to carry on the same for a period of more than three months, the lease shall be subject to cancellation. Provided, however, that if at least \$2,000 has been expended in actual boring operations, such expenditure shall be accepted as compliance with this provision for the year during which such expenditure was incurred.

9. A lessee, who has acquired by assignment or otherwise more than one lease may be permitted to consolidate his operations and expenditure, and to install machinery and equipment on one or more of the locations described in the lease affected. Provided that such consolidation shall apply only to the second and third years of the term of the leases and shall comprise only such basis as may at that time, be included in such consolidation. The group shall not exceed an

\*Order in Council, Jan. 19th, 1914.



area of 20 square miles, nor shall the locations be separated from one to the other by more than two miles.

10. The lessee shall at all times take reasonable measures to prevent the injurious access of water to the oil-bearing formations. Upon a well proving to be unproductive, or ceasing to yield oil in paying quantity, or being abandoned for any cause, the lessee shall be at liberty to withdraw the casing from the said well, but in order to prevent water gaining access to the oil-bearing formation, the lessee shall immediately close the well by filling it with sand, clay, or other material which may have the effect of preventing water from gaining access thereto.

In case natural gas is discovered the lessee shall take all reasonable and proper precautions to prevent the waste of gas, and his operations shall be so conducted as to enable him, immediately upon discovery, to control and prevent the escape of gas. Should salt water be encountered, the lessee shall immediately and effectively close the well at such a depth as may prevent such water from gaining access to the oil-bearing formation.

The Minister may, from time to time, make such additional regulations as may appear to be necessary or expedient, governing the manner in which boring operations shall be conducted, and the manner in which the wells shall be operated; failure on the part of the lessee to comply with such requirements will render the lease subject to cancellation.

11. No royalty shall be charged upon the sales of petroleum up to January 1st, 1930, but a royalty at such rate as may be specified by Order in Council may be levied on the natural gas products of a leasehold.

12. Any company acquiring leases shall at all times be and remain a British company, registered in Great Britain or Canada; the chairman, and a majority of the directors shall, at all times, be British subjects and the Company shall not at any time become, directly or indirectly, controlled by foreigners or by a foreign corporation.

13. The Minister may at any time, if considered necessary by the Government of Canada, assume absolute possession and control of any location, together with plant, equipment, etc.

14. If oil in paying quantities is discovered the lessee shall work the wells uninterruptedly in accordance with the provision of these regulations and to the satisfaction of the Minister so long as the wells yield oil in paying quantities.

15. At the end of each year of the term of the lease the lessee shall furnish a statement, supported by affidavit, showing the number of days during the year that operations were carried on upon the location; the number of men so employed; the character of the work done; the depth attained; the total expenditure incurred; a detailed statement setting out fully the purpose for which such expenditure was incurred; the quantity of crude oil or natural gas obtained; and the amount realized from the sale thereof. Failure to furnish such yearly return will render the lessee subject to a fine of ten dollars (\$10.00) a day for each day's delay in furnishing the sworn statement, and after three months delay the lease shall be subject to cancellation.

The provisions of these regulations are such as to encourage prospecting for oil and gas and, to a certain extent, protect the rights of the people. Although the terms of the lease are very favorable to the lessee no provisions are made with regard to obtaining additional information from the lessee for the public good.

The following important provisions should be added to all boring regulations:

1. Exact locations of all bore-holes shall be filed with the Government.

2. Logs of all bore-holes, giving the kind and thickness of all formations passed through shall be filed with the Government.

3. All abandoned natural gas wells shall be plugged in a proper manner prior to abandonment.

4. A royalty shall be levied on natural gas, but subject to a rebate of all or part of the same if the gas is used.

#### **Records of Bore-Hole Locations.**

In order to establish the position of a bore-hole its situation should be referred to a permanent monument erected near the bore-hole. It is also desirable that the position of the monument be referred to a prior land survey or to some prominent landmark or topographical feature. This could be done at little additional cost to the lessee.

Records of all the holes drilled through coal formations in the West should be filed with the Government, in order to protect future coal mining operations. If holes are drilled through coal measures in order to reach the oil or gas zone below, and, after finding natural gas, the casing is withdrawn and the well abandoned, the gas "feeders" will be of great danger to future coal mining unless accurate records are kept.

When one considers that one volume of methane mixed with seventeen volumes of air is inflammable, it can be seen that it requires but a small addition of natural gas to the mine air in order to make the mine unsafe.

#### **Records of Bore-Hole Logs.**

A well-driller generally keeps an accurate log of the hole drilled, showing the depth of the hole and the thickness and kind of formations passed through. In other words, the log gives a vertical section of the formation at that point. The information thus obtained, if filed with the Government, would prove to be of great value for the following reasons:

The Dominion Government is expending large sums of money in mapping the geology of the country, and the information thus obtained is largely areal. If the information contained in bore-hole logs were available it could be co-ordinated, and thus facilitate the working out of the stratigraphy, thereby promoting economy and efficiency. The co-ordinated information would not only materially assist the actual drillers in an oil or gas field, but would also be of value to companies contemplating drilling operations in a field that had been drilled before. If the information on file were adverse, it would save such companies much trouble and expense incident upon duplicating the work.

Records of bore-hole logs would also give the Government more information concerning the value of coal seams on public lands. As bore-holes in Western Canada are drilled on lands in which the mining rights are held by the Crown, it would not be too much to ask the drillers to furnish information which they already have and thus make it available for the public good.

#### **Plugging of Abandoned Gas Wells.**

In the past, enormous quantities of natural gas have been wasted both in Eastern and Western Canada. In a gas-field, a careless driller may either lose control of the well through carelessness or ignorance, and abandon it without plugging it. Not only is his own pro-



perty destroyed, but the surrounding area is also drained, thus injuring the entire community through the carelessness of a single individual. His acts thus become a matter of public concern and a proper field for legislative control.

The province of Ontario has reduced the waste of natural gas to a minimum, by causing all abandoned wells to be plugged and by levying a tax of two cents per thousand feet, with a rebate of 90 per cent. when the gas is used.

A natural gas well at Pelican Portage, Alberta, has been burning and wasting gas for the last fifteen years. Although there is, at present, no market for this gas, such a circumstance demonstrates the possibilities of waste under existing laws. No one can doubt that, in the near future, there will be an enormous market for this valuable mineral resource.

#### Royalty on Natural Gas.

A royalty should be levied on all natural gas obtained from an oil or gas well. The purpose being not to raise a revenue by such tax, but to guard against waste. All or part of the royalty should be refunded if the gas is used for other than wasteful purposes.

In Ontario, an Act was passed in 1907, levying a tax of two cents per thousand feet on natural gas with a rebate of ninety per cent. when the gas is used in Canada.

#### PROPOSED GENERAL STRIKE IN BRITISH COLUMBIA.

The following information concerning a "Special Convention of the British Columbia Federation of Labor," opened in Vancouver, B.C., on the morning of July 13, has been taken from lengthy reports published in a provincial labor newspaper.

Delegates from labor unions in every part of the Province assembled in the Labor Temple on Monday morning, in response to a call for a special convention by the executive of the Provincial Federation of Labor. More than sixty are representing unions in the cities of Victoria, New Westminster, and Vancouver, and forty others from Vancouver Island and interior points.

After the convention had been called to order, Mr. Robert Foster, of Cumberland, Vancouver Island, president of District 28 of the United Mine Workers of America, explained why the call for a special convention had been issued. He stated that the miners now on strike on Vancouver Island were primarily responsible for the call, as they were satisfied now that a change of policy was needed in the methods to be adopted to bring this strike and consequent troubles to a finish. Persuasion and pleading methods had utterly failed to produce anything approaching solution, so the miners desired to consult the members of other organizations in the Province with a view to taking some common action. Appealing to the convention in a general way for assistance, he indicated that what they were now looking for was not new laws, as they had been unable to enforce what they had, but as the workers comprised 80 per cent. of the voters of the Province that combined action should be taken at the ballot box, in order to ensure a satisfactory settlement. Concluding, he offered this as a possible remedy for existing conditions, and stated that in calling a special convention the object aimed at was to devise ways and means of taking joint action throughout the Province in this direction.

At the afternoon session the first speaker was Mr. Chris. Pattinson, ex-organizer of the United Mine Workers on Vancouver Island, and now editor of the Nanaimo "Labor Telegram." Emphasizing the incidents and lessons of the strike, he appealed to the re-

presentatives of the other organizations to note that if it was found to be possible to crush a section of the Canadian workers when they were backed by a powerful organization such as the United Mine Workers of America, then it was equally possible to do so with all others.

Mr. Frank Farrington, of Seattle, Washington, in response to calls from delegates, addressed the convention. After relating efforts made by miners on Vancouver Island to organize under an International Union and making statements against the Canadian Collieries Co. and the Dominion Minister of Labor, he said that the strike on Vancouver Island had to date cost the United Mine Workers \$1,250,000; they had been disbursing a weekly amount averaging more than \$16,500. This money, he asserted, "has been wrung from the sweat and small wages of men who need it almost as much as the miners to whom it has been paid, but it has been subscribed willingly and there is more where it came from." He bitterly referred to the administration of British Columbia laws in regard to mining, and particularly instanced the granting of 90 certificates at one sitting of the examination board to Chinese strikebreakers, and added "every one of which certificates was issued in direct violation of the Coal Mines Regulation Act."

(Note.—The assertion about 90 certificates having been issued to Chinese strikebreakers at one sitting of the examination board is a characteristic misstatement, of which prominent men among the strikers have several times been guilty.)

The Chief Inspector of Mines assures us that the largest number of men who presented themselves for examination at any sitting of the board was 63. This official, availing himself of his right to do so, attended that meeting and declined to allow 13, who could not prove that they had worked 12 months in the mines, to be examined. Of the remaining 50 men, 14 failed to pass. The 36 who were given certificates of competency comprised 18 whites, 17 Chinese, and 1 Japanese, all of whom fully met the requirements of the Coal Mines Regulation Act. From Sept. 1, 1912, to date, only 93 Orientals have been given certificates of competency).

Discussion was continued at Tuesday's sessions, and on Wednesday morning a vote was taken on a substitute motion submitted by Delegate Pattinson which included the following: "That this convention advise labor in the Province of British Columbia to engage in a general strike, and further that four men be sent out to propagate the idea of a general strike, and on an educational tour." This motion was carried by 48 in favor to 36 against. About 20 delegates did not poll their votes, owing to absence from the convention or other reasons. An analysis of the published "roll call vote" gives the following results: New Westminster, 1 for and 5 against; Victoria, 7 for and 8 against; Vancouver, 14 for and 21 against (12 did not vote); Vancouver Island coal mining centres, 21 for and 1 (typographical union) against. Fernie, Crowsnest district, none for and 3 against. Several other centres, 5 for and none against. Of the 48 who voted in favor of a general strike, 22 were Vancouver Island delegates of the United Mine Workers of America, and four were delegates from Western Federation of Miners' unions in the metal mining districts of the interior of the Province. Of six delegates from Trades and Labor Council, two voted for and four against. Summarizing the result, it is seen that outside of the 26 delegates representing miners' labor unions, only 22 of more than 50 remaining delegates voted in favor of a general strike.



# CAUSES AND PREVENTION OF TUNNEL ACCIDENTS\*

By D. W. Brunton and J. A. Davis

(Continued from Last Issue)

## Haulage.

A large proportion of the injuries attributed to tramming is caused by the practice of riding on the cars, especially loaded ones. When riding on the top of a full trip, a man is always in danger of a serious injury at every low place in the roof, and if he is riding between the cars (or any place but the rear end), he is liable to be jarred from his foothold and dragged under the cars, and in case of derailment he has little chance of escape. The risk of derailment is unavoidable in tunnel work, partly because of the insufficient illumination under which tramming is generally carried on, and partly because of the difficulty of keeping the roadbed in good condition or the track clear of small obstructions. Even when riding on empty cars there is serious risk whenever the miner sits on the ends or sides and allows his feet to hang over; the safest way is to sit inside of the car and to crouch low enough to avoid being struck by any jutting place in the roof. The arms and hands should be kept inside of the car to avoid the possibility of being caught between the car and the wall at a tight place. The driver or "mule skinner" is usually compelled to ride on a loaded trip and sometimes at the front end of the train in order to be near the animal he is driving; the extra hazard of this position should be fully realized and extra precautions taken. The dangerous practice observed on the part of some drivers, of riding with one foot on the bumper and the other on the chain by which the mule pulls the trip, is every obvious and can not be too strongly condemned. This act should be made sufficient cause for instant dismissal. It ought not to be necessary to mention the danger of attempting to jump on or off a moving trip of cars, because the chances in such a case of a man missing his footing and being caught or dragged under the cars, or of breaking an ankle or leg in the uncertain light, should be so clearly seen that no one ought to consider the risk worth taking; but the number of injuries arising from this cause shows only too well that this precaution is habitually disregarded.

Great care is necessary during the operation of placing a derailed car back upon the track. It is very easy for a miner to strain or otherwise injure himself if he attempts to do this without getting some one to assist him. Also in handling a derailed car that is full of rock there is danger of the block or crowbar slipping and allowing the car to drop suddenly on the miner's foot or hand, if indeed it does not topple over completely and crush him against the side of the tunnel.

Failure to allow sufficient room to a passing trip of cars is also a frequent source of injury. Before going into a strange tunnel the miner, if he is not accompanied by some one familiar with the tunnel, should always ascertain upon which side of the track there is the most room, and in meeting a passing trip should always give the animal pulling it all the space possible, so as to avoid being tramped on or kicked, or being caught between the cars and the walls of the tunnel. It is also advisable to hide any light when meeting a horse or mule, for there are some animals

that are especially afraid of the high-powered acetylene lamps that are coming to be used almost entirely in tunnel work. If the animal balks when coming toward a light a serious mixup may occur, as the cars behind can not always be stopped at once. In a tunnel as on the surface, attention should always be given the heels of animals whether moving or at rest, and it is best to speak to animals when approaching them from behind, for many serious injuries have been caused by passing too close to nervous animals without warning. When turning a horse or mule around in a heading, the driver should watch carefully to see that he is not stepped on; inane as this advice sounds, many really serious accidents have resulted from just this simple cause.

## Electricity.

An examination of reports of electrical accidents in tunnel work shows that in most cases the shocks were caused by the trolley wire. This is not surprising when one considers the many factors that unite to make an electrically charged wire especially dangerous underground. The earth is almost always used to complete the return circuit and, therefore, if the miner inadvertently touches any part of an electrical apparatus that is charged with current, and if he is not well insulated from the ground, he will certainly get a shock, the intensity of which will depend on the voltage or pressure of the electric current and the incompleteness of his insulation from the earth. Some trolley wires carrying a current as high as 600 volts have no insulating or protecting covering whatsoever and most of them are without a guard or shield of any sort, although they are sometimes placed less than a man's height from the floor and directly over the rail. Then, too, tunnels are generally damp or wet, so that a man is rarely well insulated from the ground. As the light at best is poor, one can not always see the wire as he approaches it, and the space is so restricted that a man walking in the tunnel must keep his head close to the wire when at the same time the most of his attention must needs be given to his footing. Moreover, in climbing into or riding in the cars, most of which in tunnel work are of metal and furnish excellent electrical connection with the rails, one's head must pass close to the live wire. The carrying of metal tools, such as crowbars or drill steel, also picks and shovels with wet wooden handles, is also the cause of many shocks through their accidental contact with the trolley, especially if such tools are carried on the shoulder. It is therefore important, when walking in a tunnel where a trolley wire is installed, constantly to bear its existence in mind and take every precaution to avoid contact with it either by hand, wet clothing, or tools.

In addition to the trolley wire there are in tunnel work other sources from which electrical shocks may be received. Wherever the heading is illuminated by electricity, the lights are usually grouped in a cluster and connected to the main circuit by means of a flexible cable, so that they can be removed easily to prevent breakage during blasting. The wires of the cable are, of course, insulated, but owing to rough usage the

\*Extract from Bulletin 57, published by the U.S. Bureau of Mines.



insulation is often damaged or scraped off, leaving the bare wire exposed. Even a slight damage of the insulation is often sufficient to permit a considerable leakage of current from which a person handling the cable may receive a severe shock. Such wires are the more dangerous because, supposing them to be protected, one is more apt to handle them carelessly. The men who remove these wires preparatory to blasting and afterwards replace them or otherwise adjust them should examine them closely and not touch any place where the insulation has become damaged.

Shocks are also caused by motors, transformers, or other pieces of electrical equipment that are supposed to be safe but have accidentally become charged, and by switches and other similar devices during adjustment or repair. In handling apparatus of this sort a workman should carefully insulate or otherwise protect himself from the current and should try to handle the apparatus in such a manner that any involuntary muscular reaction from a shock will throw him clear of its live parts, rather than bring him more closely in contact with them. Although electric locomotives are usually in such perfect contact with the rails that a person touching any charged part of the frame will rarely receive a shock, there are times (as, for example, when there is a considerable amount of dirt or sand on the rails) when the locomotive is almost completely insulated from them; in such a case anyone coming in contact with a live part of the frame or of the draw-bar, or even with one of the cars coupled to the locomotive, may receive a severe shock, which is apt to be all the more serious because it is unexpected. For this reason the touching of such equipment should be avoided unless actually necessary.

Mention should be made here of the immediate steps to be taken in case a man has received a severe electric shock and is perhaps lying unconscious and seemingly dead, for it is often possible by prompt treatment to revive and restore a man in this condition who might otherwise fail to recover consciousness. Methods recommended by the bureau are described in *Miners' Circular*.

### Fire.

The chief danger from fire to the men in a tunnel is the possibility of the buildings at the surface becoming ignited. These structures are, of course, subject to the same causes of fire as ordinary buildings, such as the careless handling of matches or lights, spontaneous combustion of oily waste wherever it is allowed to accumulate, or the short-circuiting of electric wires, not to mention the risk of forest fires in heavily timbered regions. At a large majority of tunnels now being driven the blacksmith shop, the store-room, the boiler house, and other buildings are situated much closer than the 200 ft. that should separate them from the tunnel portal, and in many districts, especially where the winter snowfall is heavy, they are directly connected with the tunnel by snowsheds constructed of wood. At such tunnels, also, means of exit other than the portal are seldom provided, so that in case of fire in these buildings men are penned up in the tunnel and in the customary absence of a fire door, are in serious danger of suffocation from the gases and smoke produced by the conflagration. It is therefore essential, and in some States it is required by law, that in all tunnels where combustible structures must be erected nearer to the portal than 200 ft. there should be a separate exit at least 200 ft. away, and that a fireproof door that can be closed from a distance should also be provided. A sufficient water

supply should always be maintained to put out a fire, and hydrants with a coiled  $1\frac{1}{2}$  in. hose and a nozzle should be placed not less than 40 ft. and not more than 100 ft. from each building or group of buildings.

Most tunnels, except where timbered, are practically fireproof, and hence underground fires are not common in tunnel work. It is nevertheless important to guard against the dangers of underground fire. Whenever such fires do occur they usually start in some small way, either from candles or lamps being placed too near the posts or caps of a timber set, or from a match or the coals from a pipe thrown into a pile of rubbish, hay or other combustible material that may in turn ignite the timbering. Although such fires can usually be extinguished before any great damage has resulted, provided their presence is discovered soon enough and there are means at hand to extinguish them, it is much better to prevent the ignition by obviating causes. Therefore, combustible rubbish should not be allowed to accumulate in the tunnel, and any supply of hay for the use of the mules or horses underground should be carefully stored in a shed provided for that purpose, and open lights or smoking should not be permitted in its neighborhood. Candles or torches should never be left burning near timbers, and the practice of wedging a lighted candle between two nails driven into a post should be sufficient cause for the instant dismissal of the guilty person.

### Water.

Water under pressure is another source of danger in tunnel work. Men may be hurt in jumping back to avoid the rocks and other debris often carried with it, or perhaps buried under an accompanying rush of mud and sand. A good example of this may be found in the records of a foreign railway tunnel, where a cleft filled with water, sand and gravel was encountered and the ensuing sudden and violent imburst filled up more than a mile of the tunnel in a very few minutes, burying 25 workmen beyond all hope of recovery. A somewhat similar occurrence in one of our American tunnels was likewise due to water. The tunnel caved in at a point about 4,000 ft. from the heading, but the men working there were warned in time to escape, although they had barely reached safety before the tunnel became entirely closed. When this happened the mass of muck, composed chiefly of soft clay and running shale impervious to water, formed a dam that cut off from the main part of the tunnel the flow of approximately 2,700 gallons per minute. As soon as the part of the tunnel between the cave and the heading became filled with water, the full pressure of the head in the mountain over the tunnel was exerted against the dam, forcing it down the tunnel until the pressure was relieved. The additional length of the debris then offered greater resistance, and it remained stationary until the pressure had again accumulated enough to move it. This process was repeated until 440 ft. of tunnel had been filled. Several attempts were made at first to relieve the pressure by inserting a section of ventilating pipe at the top of the dam; but after several men had narrowly escaped being buried by the rush of mud as the dam moved forward this scheme was abandoned and the tunnel was sealed up by a concrete bulkhead, the men being protected by a temporary bulkhead of wood during the construction of the permanent one.

In driving through limestone and dolomite it is not unusual for a tunnel heading to tap immense caves filled with water, mud and sand. The volume of the fluid mass flowing into the tunnel is determined by the size of the opening, and its velocity is proportion-



ate to the head. Under the pressure of a head of 300 or 400 ft. the cutting action of the rock particles and sand carried by the water soon enlarges even a drill hole to a size that permits the filling up of the heading in an incredibly short time. When a round of shots breaks into a cave of this kind, the heading and perhaps the completed tunnel for a distance of hundreds and even thousands of feet back from the face may be filled so fast that the escape of the workmen is impossible if they are at the face. Fortunately, however, during shot firing, the time of the greatest danger, the men are always out of the heading.

When an underground cave or reservoir filled with water, mud, sand and loose rock is tapped in a tunnel heading, one of two things occurs; generally the cave or reservoir empties itself completely into the tunnel and, after the flow is over, the solid matter that the flood leaves behind can easily be shovelled up and hauled out. Sometimes, however, the volume of solids is so great that the tunnel is completely choked before the reservoir is emptied. In these cases, when the flow of water ceases, the men are usually set to work cleaning up the material with which the tunnel has been filled, but when this cleaning process advances sufficiently to weaken the dam that holds back the flood a new outburst occurs and, because the passageways have already been opened, the second outbreak is often more violent and dangerous than the first. If this operation were repeated often enough, the cave or reservoir would, of course, be drained and the heading be regained, but in many instances the operation of attempting to regain the heading has been found so dangerous that it has been abandoned and a curved tunnel has been bored to pass around the danger point.

In the dolomite in the Cowenhoven Tunnel, at Aspen, caves of this kind filled with water and dolomite sand were frequently encountered. It was no uncommon thing after a round of shots to have the tunnel completely filled for hundreds of feet back from the face. As soon as the water from the cave that had been tapped drained off, the mud and sand were easily loaded and work in the face was resumed.

An immense cave was tapped by a drill hole in a long crosscut that was being driven from the tunnel to the Della S. mine. The drill hole, under the pressure and cutting action already described, enlarged so rapidly that the men fled from the face, and a few seconds after the opening must have enlarged to a size that permitted the filling of the tunnel with such rapidity that the tunnel cars were hurled back and flattened against the posts. Several unsuccessful attempts were made to regain the face, which finally had to be bulk-headed and the tunnel run around it, as at the Simplon tunnel in Switzerland.

Numerous caves were encountered in the 1,200 ft. level of the Free Silver mine, which was also run through dolomite; but, fortunately, although they must have extended to great heights, their horizontal cross section was very much less than that of the caves 1,200 ft. above. When these reservoirs were tapped with a drill hole, the water would spout out with such velocity that it was impossible to stay in the face, and in a short time the opening would be worn to a size which sometimes increased the amount of water to be handled by the pumps to 3,000 and even 4,000 gallons per minute. At first the noise from the in-rushing volume of water was exceedingly terrifying to the men, but in a short time whenever a cave of this kind was tapped the men simply joined hands to assist each other in maintaining their footing and waded

back with the torrent as they would do in crossing an extremely rapid stream. Many narrow escapes occurred, but, due to the precautions taken by the management and workmen, no serious accidents occurred during any of these inrushes.

### **Intoxication.**

Although few accidents in tunnel work are traced directly to intoxication of employees, the extent to which it contributes to many mishaps that are attributed to other causes is perhaps too little appreciated. The fact that a man who has put an "enemy into his mouth to steal away his brains" is then much more liable to be careless or negligent of his own safety and the lives of the men around him is so true as to be almost axiomatic. Even a slight amount of intoxication, which might be allowable if the work was to be done on the surface, is dangerous under ground, where it is very apt to be aggravated greatly either by the lack of fresh air or by the heat, neither of which is unusual in tunnel headings. Therefore it is essential that a man in such a condition should not be permitted under ground and, if discovered there, should immediately be sent out of the tunnel by the foreman. Repeated offences should result automatically in dismissal.

### **Prevention of Accidents.**

In discussing the prevention of accidents in tunnel work, little is to be gained by arguing whether the manager, the foreman, or the miner is solely to blame for their occurrence. The greater responsibility lying, as ever, with those who have the broader vision, the manager or the superintendent is in duty bound to see that the place where the men are to work shall be made as safe as possible and to insist that they themselves exercise the greatest care and caution in conducting their work. Upon the foreman falls the responsibility of carrying out the manager's orders, of seeing that the men are instructed in the proper precautions to be taken, and that they are constantly and consistently exercised, and, if necessary, of discharging either temporarily or permanently any man who wilfully or habitually disregards them. As for the miner, whose business is shown by statistics to be a hazardous one at best, it is only through the most extreme care on the part of each man, not only for his own welfare, but for the safety of his co-workers, that he can hope to escape from the dangers that surround him. Each one, therefore, has his share of the responsibility, and it is only by co-operation between all parties concerned that any progress can be made toward the prevention and reduction of the fatalities and the injuries now encountered in tunnel driving. As it is impossible to reiterate too often the methods of obviating accidents, the following paragraphs are addressed directly to the parties most concerned, in the hope of bringing home to them once more some of the more important preventive measures.

### **Precautions for the Manager or Superintendent.**

Insist that necessary timbering be done promptly, and always keep an adequate supply of lumber at hand so that no delay may ensue from the lack of it. See that the minimum quantity of explosive is used (in order to prevent unnecessary shattering of roof and walls) and inaugurate a systematic and regular examination of the roof to insure the timbering of loose pieces at once. Have all bent or breaking posts or caps promptly replaced by new ones.



Provide suitable magazines and thaw houses for explosives.

Do not permit any disregard of the proper precautions as to handling, storing and using explosives, and see that each man is provided with a copy of such precautions. Do not permit the transportation of detonators or primers to the heading in the same bundle with the remaining supply of explosive for the blast. Have careful tests of the burning rate of the fuse made periodically, especially when a different brand of fuse is purchased, and warn the men of any discovered irregularity. Destroy any damaged fuse at once. Do not store fuse near any source of heat. Prohibit the reloading of a bore hole before it has had time to cool from a previous blast. Give the man who makes the primers the necessary equipment and tools and have him carefully taught how to prepare and waterproof the primers.

Do not purchase caps weaker than 5X for use with gelatin dynamite. See that the proper precautions are taken whenever a missed hole or evidences of one are discovered.

Institute a regular and frequent inspection of the valves on the air compressor and insist that any defective valve be promptly and properly repaired even at the cost of a possible shutdown, that there may be no explosion of gas or burning of grease in the receiver or pipe line to produce harmful gases and jeopardize the safety of the men at the heading. Do not delay the installation of adequate auxiliary ventilating equipment when natural accumulations of harmful gases are encountered in the tunnel, particularly when such gases are of an explosive nature. When explosive gases are present, none but safety lamps or their equivalent should be permitted under ground.

Prohibit the men from riding on loaded trips, and, whenever possible, provide special cars for their use, either propelled by hand or drawn by a motor. Do not permit the men to jump on or off moving cars, nor the drivers to "ride the chain." Tell all new men the proper side of the tunnel to take when meeting a trip, and caution them to shield any bright light when so doing.

If there is a trolley wire or other electrical apparatus in the tunnel, caution the men against its danger, and do not allow them to carry tools on their shoulders when passing in or out. See that the cable or wires leading to any temporary or movable cluster of lights in the heading is kept in good repair. Instruct the men, especially the foremen, as to the proper methods of resuscitation in a case of electric shock.

Prohibit the accumulation of combustible rubbish any place in the vicinity of buildings or timbering and see that the supply of hay is properly confined to prevent danger from fire. Unless absolutely necessary, do not construct any wooden buildings nearer than 200 ft. to the mouth of the tunnel. If wooden buildings must be built near the mouth, provide a separate exit from the tunnel at least 200 ft. away, with a fire door that is arranged to be closed from a distance. In either event, provide an adequate water supply, with hydrants and hoses, at suitable distances from the several buildings.

Exercise great precaution when driving toward a place where a flow of water is likely to be encountered that might carry with it a rush of mud, sand, gravel or other debris, and take immediate steps for the safety of the men as soon as such a flow is struck.

Prohibit the drinking of intoxicating liquors on property controlled by the tunnel company and institute

a system of inspection to prevent any intoxicated man from working in the tunnel, discharging habitual offenders against this rule.

#### Precautions for the Foreman.

Insist that the least amount of dynamite required for loading "back" holes shall be used. Do not return to the face after blasting nor permit the men to return without first examining the new roof. Upon arriving at the heading immediately detail as many men as may be required to clean the roof before attempting any other work under it. When passing in or out of the tunnel never fail to inspect the roof, testing any doubtful piece for possible vibration. See that any loose piece of rock is either pulled down at once or properly supported, and never take any chances by postponing the work of timbering no matter how pressing other matters may be, because a few minutes' delay in timbering may cost several lives. Have any timbers showing the effects of too great pressure relieved properly as soon as they begin to fail. When timbering is necessary close to the face, see that the front sets are thoroughly braced and blocked before firing. When the roof "breaks high" fill the space between the lagging and the roof with broken rock or blocking to prevent a large rock from crashing through the lagging upon the men beneath.

See that the men read the precautions to be taken in handling explosives, or have a copy read to them. Do not permit any instance of careless or reckless handling of explosives to go unchallenged and do not fail to discharge men for the first grave offence of this character. Never permit a man to handle dynamite recklessly, either for the purpose of scaring someone or for any other reason. See that the detonators and primers are transported to the heading in boxes separate from the rest of the supply and that they are not placed side by side after arriving. Insist that proper care be used in loading holes and that the tamping be done by pressure rather than by impact. Never allow anything but wooden bars to be used for this purpose. Do not permit a bore hole to be loaded before it has had sufficient time to cool completely from the previous blast.

Warn the men of any change in the rate of burning of fuse. See that they do not mutilate the fuse by rough handling and that they do not crack or break it by placing the primer in the hole fuse end first, or by uncoiling the fuse roughly in cold weather. Do not use fuse that has been stored or kept near a boiler, steam pipe, or other source of heat, or that has been exposed to moisture. See that the fuse is properly coiled close to the hole before blasting, in order that it may not be torn out by the blasts in a nearby hole. Instruct the men as to the proper way to prepare a primer. See that the fuse is cut squarely; that an inch or so of it is discarded; that the grains of powder do not leak out of the end that is inserted into the detonator; that the crimping is done carefully with the proper tool; that the detonator is not buried too deeply in the dynamite; and that caps of sufficient strength are used.

Always count the holes as they are blasted and never fail to inspect the new face for evidences of missed holes. See that any such are detonated properly as soon as they are discovered, even at the possible cost of some delay. Insist that the shovelers use their picks properly when picking down the muck pile. Keep a close watch for any unexploded dynamite in the muck and have the men do likewise. When such



is found remove it carefully to a place of safety and be particularly cautious when a piece of fuse accompanies it. Never start a new hole in the remains of one that has ever held dynamite.

When the presence of any amount of dangerous gases, either from explosives or from natural sources, is suspected see that the men are supplied with fresh air, either by opening the compressed air line or by breaking into the ventilating pipe, if the current is in the right direction. Do not knowingly remain or permit the men to remain in any atmosphere that will not support a candle flame, because there is no way to determine how bad it may be after the light becomes extinguished. See that the men do not use anything but safety lamps, or their equivalent, in tunnels where explosive gases are encountered, and do not permit any matches or other means of striking an open light to be carried into such a tunnel.

Have the track and roadbed kept in as good condition as possible in order to lessen the risk of derailments. Do not permit men to ride upon loaded trains unless it is absolutely necessary, and in such cases warn them carefully as to the risk being taken. Insist that the men riding in an empty car keep their feet and hands inside the car and that they watch carefully for low places in the roof. Never fail to discharge any driver caught "riding the chain." See that the men give an approaching train of cars plenty of room, and if animals are used to draw the cars see that the men hide their lights when the animals approach.

Warn the men of the danger from the trolley wire. Familiarize yourself with the proper means of resuscitation after an electrical shock. See that the men are not permitted to carry on their shoulders tools or other instruments that are conductors of electricity. Inspect regularly any cables or wires used for carrying electricity to lights in the heading, or any others that have to be moved frequently, and see that all worn parts are covered with insulating material or replaced if necessary. Do not permit the men to ride on electric locomotives.

See that no piles of combustible rubbish are allowed to accumulate underground, and do not permit the use of candles or torches in the vicinity of hay or other inflammable substances. Do not fail to discharge any men guilty of leaving candles or torches burning near timbers, especially when a candle is wedged between two nails driven into a post.

Exercise special precautions when approaching a place where an inrush of water is to be expected.

Be particularly cautious about drunkenness. Note the men when coming on shift and do not permit a man even slightly intoxicated to go underground. If such a man is discovered in the tunnel send him to the surface at once. Discharge those who are habitual offenders in this respect.

#### Precautions for the Miners.

Do not return to the face of the tunnel without testing the newly exposed roof for loose rocks, and, if any such are discovered, either clean them down yourself or report them to the foreman. Form the habit of carefully examining the roof as you pass in and out of the tunnel, testing doubtful places for vibration; call the foreman's attention at once to any ground that you think should be timbered or to any timbers that need relieving to prevent their breaking.

If you are called upon to use dynamite, do so with great care, observing the precautions outlined in previous paragraphs. Never attempt to scare anyone by reckless handling of explosives and never treat dynamite with roughness.

Never place or carry detonators or primers and the rest of the supply of dynamite for the round in the same box or bundle. If it is your duty to assist in the loading of the holes, do this with care, using pressure rather than a blow to tamp the powder in the hole, and be careful never to use too much force in pushing it.

Inquire as to the rate at which the fuse burns, especially when a new brand is being tried, and see that the fuse is cut long enough to give you and your companions time to reach a place of safety. Protect the fuse from mechanical injury, such as scraping, blows, or too great pressure either from falling rocks or from the tamping bar; never use a fuse that has been thus damaged. Never reload a bore hole before it has had time to cool. Do not use fuse that you know has been stored near a boiler, steam pipes, or other source of heat or one that has been exposed to moisture. If you prepare the primer, see that an inch or so is cut squarely from the end of the fuse before it is put into the detonator; that no powder runs out of the end of the fuse during this process, and that the detonator is properly crimped round the fuse. Under no circumstances use anything but the regular crimping tool for this purpose.

Always inspect each new face for evidences of a misfire, and, if one is discovered, call the foreman's attention to it immediately, so that he may have it detonated. Never attempt to pick out the material in such a hole; either explode it with a primer, or, if this can not be done, drill and fire another hole at least 2 feet away. Use great care in removing any unexploded dynamite from the muck pile, and be especially cautious if a piece of fuse is discovered near it, for this may mean that there still is a detonator in the cartridge. Never handle a pick like a sledge hammer; pull or scrape the material down rather than strike it with the pick. Do not start a new hole in the remnants of a former one that has ever held dynamite, for there is always a chance that the dynamite may not have been detonated.

Whenever you feel that you are inhaling fumes from dynamite that has burned, or any other harmful gases, try to get to fresh air as soon as possible; the quickest way to do this is often to open the compressed-air line, or to break the ventilating pipe, if you know that the current is in the right direction. Never use anything but a safety lamp or a portable electric lamp in a tunnel where explosive gases are known to exist, and do not carry any other means of striking a light into such a tunnel.

Never attempt to ride upon a full car or a loaded trip; and when riding in empty ones see that your feet and hands are well inside and that your head is low enough to clear the roof at all places. Learn which side of the tunnel has the most room, and when a trip of cars approaches allow yourself as much clearance as possible. If the trip is drawn by an animal, hide any bright light you may be carrying. If it is your duty to drive a horse or mule or to run a locomotive, try to do everything possible to prevent derailments; report any places where the track or roadbed is in bad condition. Remember that the front end of the trip is the most dangerous place you can stand, so that if this is necessary you must take extra care; never under any circumstances ride with one foot on the chain by which the cars are being pulled. Take care that the animal does not step on you or kick you, and speak to him before approaching him from the rear. In placing a derailed loaded car back upon the rails, take care not to strain or otherwise injure yourself in so doing; keep your feet and hands in a safe position, and see that the car does



not topple over and crush you against the sides of the tunnel.

Bear constantly in mind that the trolley wire is dangerous and that you must pass within a few inches of it when going in and out of the tunnel, often when your attention must be given to your footing. This danger should be especially avoided when climbing into cars. When you are in a tunnel where there is a trolley wire never carry tools, drill steel, or anything else that is metal or wet on your shoulders. Do not handle any electrical equipment unnecessarily nor ride on electric locomotives. Never cause anyone to receive an electric shock; it is never possible to foretell its results. If it is your duty to repair electrical apparatus, see that you are properly insulated, or that the current is cut off and can not be turned on without your knowledge; keep your hands and body in such a position that a recoil from an accidental shock will throw you clear of any charged part of the apparatus. In removing and replacing the temporary cluster of electric lights in the heading be careful not to touch any bare or injured place in the wires, and call the foreman's attention to any damaged place you may discover. Familiarize yourself with the methods of reviving a person injured by electric shock and put them into practice as soon as possible whenever necessity occurs.

Do not smoke or throw a lighted match near any pile of inflammable rubbish either in a building or near timbering, and do not carry a candle or a torch near any piles of hay. Never wedge a candle between two nails on a post or other piece of timber; many disastrous mine fires have started in just this way.

Never take a drink of liquor before or during working hours, and do not hesitate to report any man you see doing so or who is in an intoxicated condition; your safety and perhaps your life may be sacrificed to his carelessness when under the influence of liquor.

## THE LATE DEAN GALBRAITH

Dean Galbraith, beloved of 'School' men, passed away at his summer home, Go-Home Bay, on Wednesday, July 22nd. Few men have left their mark on so many young engineers. 'Johnny' Galbraith, as he was popularly known among students at the University of Toronto, will live long in the hearts of the men who came in contact with him.

Dr. Galbraith had not been well for some years, but he kept his troubles very much to himself, and attended to his duties unflinchingly. The summer vacation afforded a welcome respite, and his friends hoped that the rest would restore him to health. Such hopes proved, however, unavailing.

The story of his last hours is fittingly told in "Applied Science," the organ of the University of Toronto Engineering Society:

"On the evening before his death, while he was having dinner on the verandah of the cottage with members of the family and friends, he remarked on the quiet beauty of the evening and thought that surely no one could wish for anything nicer than what had been their lot that day. He was in great spirits and sat on the verandah until late in the evening admiring and enjoying, with the true appreciation of a lover of nature, the quiet solitude of the surroundings as the sun in all its splendor, sank behind the horizon.

"When he had retired a short while he was seized with a chill, no doubt due to a weakening of the heart, but he soon felt better and insisted that they should

retire again, stating that he would be quite well in the morning. However, about four o'clock the family were summoned to his bedside and he peacefully passed away without awaking from a quiet sleep. In the quiet solitude of the early morning a noble life in all its splendor sank behind the horizon of mortality to cast off the earthly burden of clay, and awake arrayed with celestial radiance, in the Mansion which he had been building with his good and noble deeds on earth.

"The remains were brought to Toronto on Thursday evening, and after the funeral service on Saturday afternoon at the Church of the Redeemer, were conveyed to Mount Pleasant Cemetery for interment. It is certain that a more impressive or more representative funeral was never held in Toronto. Every engineering class since the founding of the 'School' was represented and engineering organizations throughout and beyond the Dominion paid tribute to the father of engineering in Canada. The Provincial and Dominion Governments expressed their appreciation of one of the greatest builders of the country which they represented. Prominent engineers from Canada and the United States attended, to show their respect for the leader of the profession in Canada. The floral tributes from the numerous engineering organizations and the various year classes of graduates and undergraduates, as well as from personal friends and many other sources, expressed in no uncertain tone the continent wide admiration with which the Dean was regarded, and the deep regret which was felt at his unexpected death."

Dr. Galbraith was born of Scotch parentage in Montreal on September 5, 1846. He received his early education at Port Hope and registered in arts at the University of Toronto in the fall of 1863. In 1868 he graduated, receiving the degree of B.A., with a double scholarship in mathematics and general proficiency. He was a gold medallist in Honour Mathematics, and he won the Prince's prize for highest general proficiency, established by the late King Edward VII during his visit to Canada, when he was Prince of Wales. He received the degree of M.A. from the University of Toronto in 1875. In 1902 the honorary degree of LL.D. was conferred upon him by his alma mater, and in 1903 Queen's University honored him with the same degree.

In 1886 he married Miss Emily Stupart, youngest daughter of the late Capt. R. D. Stupart, R.N. His widow and one daughter, Beatrix, and two sons, John Stupart, of the engineering staff of the Toronto Harbor Commission, and Douglas, an undergraduate in civil engineering at the University, survive him.

Dr. Galbraith was one of that body of eminent men whose working life has been contemporaneous with that of the Dominion, and who with quiet and consistent patriotism have struggled for its upbuilding and have prospered with its growth. With the establishment of Confederation there came an outburst of engineering activity, especially in transportation work, throughout the settled portions of Canada. Upon graduation, Dr. Galbraith found employment in the railroad field, getting his professional training as apprentice to Professor L. B. Stewart's father, Mr. Geo. A. Stewart, at that time chief engineer of the Midland Railway, and also an engineer and surveyor of extensive private practice. He completed his apprenticeship, qualifying as provincial and also Dominion land surveyor. In 1871, after a year's service as contractor's engineer on the construction of the Intercolonial Railway, then being built by the Dominion Government, he returned to the Midland Railway as resident en-



gineer, and afterwards division engineer, on the Midland Railway extension to Georgian Bay. From 1875 to 1877 he was employed on surveys for the Canadian Pacific main lines, then under direct government control, and for the projected Georgian Bay branch of that undertaking.

Upon the founding of the School of Practical Science in 1878, Dr. Galbraith was appointed to the chair of engineering and in 1889 was made Principal of the "School." In June, 1906, the "School" became the Faculty of Applied Science and Engineering of the University of Toronto, and Dr. Galbraith was appointed Dean of the Faculty, which position he so ably and nobly filled until the time of his death.

His activities were by no means limited to his academic work, although it received his first attention, he having consistently refused to undertake professional work as a consulting engineer whenever it was likely to interfere with his work at the "School." He has occupied many honorary positions, including those of vice-president of the Ontario Land Surveyors' Association, vice-president of the Engineering Section of the British Association for the Advancement of Science, vice-president of the Engineering Section of the American Association for the Advancement of Science, and vice-president of the Canadian Institute, Toronto. He was an associate member of the Institute of Civil Engineers, England, and was one of the founders of the Canadian Society of Civil Engineers, of which society he was a councillor for many years, and of which he was elected president in 1909.

When, in 1907, the engineering world was startled by the fall of the Quebec bridge, it was recognized in Canada that the disaster must be investigated by commissioners of unquestioned impartiality and integrity and of sound engineering knowledge, whose conclusions would be unhesitatingly received by the country at large, the undertaking having been practically a Government work. Dr. Galbraith was appointed a member of the commission to inquire into the cause of the disaster, his ability as an engineer having long before been realized by the engineering profession. The thoroughness and comprehensiveness of their report speaks volumes for the capable and painstaking work of the commission, and contributes a valuable addition to the engineering literature of to-day.

On November 4th, 1908, the graduates and undergraduates in engineering presented the University with a large portrait of their Dean, in recognition of the unselfish interest which he had always taken in them, and of the true worthiness of the subject of the portrait.

Although he had not quite lived the allotted span of three score years and ten, we must remember that there is breadth and depth to life as well as length. His life was broad in every sense of the word, his influence reaching out to every class of men, for he manifested an interest in every movement which appeared to be in the interests of humanity. Through his strength of mind he could control the strongest men, and revelled in the intricacies of the many weighty problems connected with his work and profession, while his kindness and largeness of heart made him the idol of children and rendered him appreciative to the fullest degree, of the beauty and healing influences of God's teacher, Nature. His benign influence penetrated the deepest depths of every heart which came within the sphere of his life, and his comprehensive under-

standing fathomed the deeper problems of life, and won for him a place among the men whose efforts have enthroned them on the pedestal of honor and respect.

In his demise the engineering profession has lost a leader. He had undoubtedly accomplished more in the interests of the profession in Canada than any other individual. At the time of the founding of the S. P. S., engineering education had not been introduced in Canada, and by many was not deemed practicable or worthy of serious consideration, but in spite of discouraging circumstances it was fostered by Dean Galbraith until he finally proved the justification of his contentions, which were prompted by a foresight reaching far into the future. He built up the "School" until to-day it stands among the foremost engineering colleges of the world. He has prepared thousands of young engineers to go out and develop the wealthy resources of the Dominion.

The loss to the University is indeed a serious one. His name inspired confidence in the manufacturer and in the commercial man, and as a result the University enjoyed the accumulated patronage which was the outcome of credit reflected upon it by the life and associations of Dean Galbraith. He had effected a bond among the graduates in engineering, which fostered a loyalty to their alma mater such as is not evidenced in any other faculty or in any other University.

He had always been the students' friend. He was one of the very few men of our universities, who properly appreciated the position and capacity of the undergraduate. In preparing a curriculum he always gave the students' needs his first consideration. He won many a concession for the undergraduates quite unknown to those whose cause he had championed. He always had a willing and sympathetic ear for a student in trouble, and his kind and helpful attitude won their confidence, with the result that he was looked upon by them as a real friend in whom they could confide, and whom they could approach with difficulties which confronted them. He will be missed, and sadly missed, in the corridors of the old "School" where he had been the constant recipient of well merited respect since the founding of the institution which he fostered and fashioned until his death.

His many worthy characteristics were developed and manifested to the greatest degree in his home. To those who knew him,—and our readers all knew him well,—it would be superficial to try to convey an impression of the kindness and unselfish love and companionship, which he afforded the members of his family. He was a companion to his boys and spent many days with them alone, in the pleasant retreats of Northern Ontario. He was an inspiration for good to the whole household, and his greatest enjoyment was derived from his home life.

His eulogies were spoken while he lived. Homage and tribute were paid him throughout his life, the crowning mark of respect probably being the banquet tendered to him last December in the Engineering building, by the graduates and undergraduates in engineering, in celebration of the fiftieth anniversary of his entrance to the University, and of the thirty-fifth anniversary of his appointment as head of Engineering in the University. It was a happy family reunion when over six hundred of his boys assembled, and hundreds of others too far away wired messages of appreciation, to pay tribute to the grand old man to whom they owed so much.



As President Falconer has said, he was a thoroughly trustworthy man, thorough in training, honesty, and patience. His name will be handed down to posterity as an emblem of true worth, and his life will find a prominent and enviable place in the pages of history.

## LODE MINING IN YUKON TERRITORY

The British Columbia correspondent of the Journal writes: During the week ended July 9, there was included in the ore receipts at the Consolidated Mining and Smelting Co.'s smeltery at Trail, British Columbia, a shipment of ore from Mayo Landing, Yukon Territory. As this was probably the first ore of that kind to reach Trail from so far north the following information, taken from "Mining and Scientific Press," San Francisco, California, may be of interest.

"Sixty-five tons of silver-lead ore, assaying \$250 to the ton, has been hauled from the Silver King claim to Mayo landing on Stewart river for shipment to the Consolidated Mining and Smelting Co.'s smelter at Trail, B.C. The Silver King is situated 28 miles northeast of Mayo landing. The vein where opened is 4 ft. wide, striking approximately south 15 deg. west with a dip of 62 deg. east. Both walls are well defined. The hanging wall is schist and the foot wall quartzite. Development work is being done through an incline shaft, which has reached a depth of 70 ft. The owner of the property, H. W. McWhorter, intends to this summer continue sinking the shaft to a depth of 300 ft.

"On the Adam claim, 2,300 ft. from the shaft on the Silver King, Mark Evans has uncovered a vein 5 ft. wide, with two bands of galena in it, varying from 1½ to 3 in. wide, which assay high in silver. As he is prospecting nearly in line with the strike of the Silver King vein, it is no doubt a continuation of the same. Owing to there being from 10 to 29 ft. of frozen gravel (glacial drift) to sink through before reaching solid formation, and which makes prospecting for the vein both slow and expensive. Jack Alvinson and J. E. Ferrel, owners of the Web Foot claim, adjoining the Silver King on the northeast, have fitted up a churn drill to prospect with. Grant Huffman, on the Mable claim, has a shaft down 28 ft., and intends to drive and try to crosscut the vein. Fifty-four claims have been staked and recorded in the neighborhood of these properties. Not having a summer road, quite a number had provisions and supplies hauled in before the snow melted and will prospect during the summer.

"The Yukon Council has voted for an expenditure of \$17,000 for roads in this district this summer, \$5,000 of which will be spent in construction of a road to the silver-lead properties. The appropriation of \$17,000, while not sufficient to build many miles of wagon road in a country like this, is evidence, however, that the Dominion Government will be willing to do more as development of the district proceeds. The opening of rich silver ore has attracted a great many prospectors, and quite a number are out in the hills around here this summer. The outlook for the future is bright for this district. A stampede is neither expected nor desired. As yet the properties are in the earliest stage of development. A prosperous and steady producing mining camp will be here in the near future."

Our correspondent adds to this that from time to time he hears of progress in Whitehorse copper camp, in Southern Yukon. An output of copper ore from the Pueblo mine, which is being operated by the Greenoughs and associates from Spokane and other parts of

the Northwestern States, is being regularly maintained, the ore being sent to the Tacoma smelting works, Puget Sound, in the State of Washington.

## McGILLIVRAY CREEK COAL AND COKE CO., LIMITED

The fifth annual report of the McGillivray Creek Coal and Coke Co., Ltd., for the fiscal year ended March 31, 1914, was submitted at the annual meeting of shareholders held a few weeks ago in Spokane, Washington, U.S.A.

The company's coal mine is situated at Carbondale, near Coleman, Southwest Alberta. It is connected by an electrically operated railway with the Canadian Pacific Railway Co.'s Crowsnest Railway. As described by Mr. W. J. Dick, mining engineer to the Commission of Conservation, there are two seams of coal separated by about 100 ft. of strata, but only the lower seam, No. 2, is being worked here; the average thickness of this seam is about 9 ft. 6 in. The seams have a strike of north 7 deg. west, a dip of 30 deg. to the west, and are occasionally broken by upthrow and downthrow faults of small magnitude.

The entrance to the mine is by a slope 280 ft. long. The system of mining is pillar-and-stall, the stalls really being chutes driven up the pitch. The chutes vary in length up to 550 ft. The main entry is driven 11 ft. wide and the rooms 8 ft. wide. Crosscuts 8 by 8 ft. are driven every 60 ft. The room pillars are 50 ft. wide. No gas has been found in the mine, but Wolf safety lamps are used exclusively underground. The blasting is done under the supervision of shotfirers by means of a battery and Monobel powder. There are three shotfirers on each shift. The tamping material is clay, which is sent into the mine for that purpose. The roof is shale, with a cap rock of shale from 1 to 3 in. in thickness. The floor is smooth and hard. The mine is ventilated by means of a Sirocco fan used as a force fan, delivering 45,000 cu. ft. of air per minute, with a water gauge of 1 in. The output capacity of the mine is 2,000 tons a day, but the daily average last year was a little less than 750 tons for every day worked.

The coal is hauled nearly two miles from the mine to the steel tippie erected alongside the Crowsnest Railway, by means of two 100 h.p. electric locomotives operating on rack rail. The tippie is well constructed to handle a large output. It is equipped with a Greene patent dump, and shaking screens and picking table for dry-cleaning the coal. Railway box cars are loaded by an Ottumwa box car loader. When visited by Mr. Dick the power plant included one 40 and one 30 h.p. boiler at the mine and two 150 h.p. boilers at the power house near the tippie, in which house also were a 150 kw. generator, 550 amperes, 250 volts, driven direct by an 18 by 18 in. 267 h.p. steam engine. The electricity generated is used for supplying power for locomotives, tippie and machine shop, and current for lighting purposes.

### The Directors' Report.

The report of the president, Mr. Lorne A. Campbell, of Rossland, B.C., and directors, under date June 3, 1914, is as follows:

"The directors beg to present to the shareholders the Fifth Annual Report, for the year ended March 31, 1914, together with the statement of assets and liabilities.



"In presenting this report to the shareholders we beg to state that the development work as carried on for the past year has turned out to the entire satisfaction of the company, as the advance given below will show:

	Mar. 31, 1913.	Mar. 31, 1914.
Main entry, north .....	4,695 ft.	7,108 ft.
Main entry, south .....	588 ft.	588 ft.
Totals .....	5,283 ft.	7,696 ft.
Counter entry, north ...	4,622 ft.	7,076 ft.
Counter entry, south ...	501 ft.	501 ft.
Totals .....	5,123 ft.	7,577 ft.

These figures show a footage of 10,406 ft. as at March 31, 1913, as compared with 15,273 ft. as at March 31, 1914—a difference of 4,867 ft. in favor of the latter year.

"The total quantity of coal marketed during the last fiscal year was 198,179.65 short tons, which was distributed in Alberta, Saskatchewan and the States of Washington and Idaho. In addition to the tonnage as stated, we had on March 31st. last, ready for immediate extraction, 659,728 tons.

"During the past year we added to our equipment 30 steel pit cars, each of 4 tons capacity, a 65 h.p. boiler, a 160 h. p. engine, a 100 kw. generator, motors having a capacity of 75 h.p., and, for haulage underground two 6 tons electric storage battery locomotives. In addition to the foregoing, many other expenditures on the plant were made, so that throughout it is in good operating condition.

"During the year the mine was worked 274 days, which shows that delays were very few during the operative period.

"From the satisfactory profit for the year, you will observe by comparison of Annual Statements a corresponding decrease in liabilities and an increase in assets to which the same was applied."

#### Balance Sheet, March 31, 1914.

Liabilities.	
Accrued payrolls .....	\$16,471.03
Accrued accounts payable..	18,908.25
Bills payable—loans .....	61,499.00
Townsite sales .....	23,463.87
Less expenses .....	587.64
Net profit for year .....	87,377.02
Capital stock .....	3,000,000.00
Contingent liability on bills receivable discounted ....	1,196.45
	\$3,207,131.53
Assets.	
Cash in bank .....	\$ 42,448.80
Accounts receivable \$53,468.18, less \$1,205.69 reserve for bad and doubtful debts. ....	94,711.28
Insurance unexpired .....	139.24
Merchandise inventories .....	18,198.78
Water supply, cottages, furnishings ...	14,745.17
Northeast Quarter Sect. 7, Township 8-4 Plant, buildings, roads, and railway sidings. ....	9,431.40
Treasury shares unsold, at par .....	211,261.21
Coal lands .....	560,920.00
	2,297,724.45
	\$3,207,131.53

#### THE KIEL CANAL.

There is a very strong sentiment in the highest financial circles that the German emperor with all his protestations of peace has been playing a war game from the beginning and has simply bided his time.

Realizing that his ambitious program might antagonize the whole world he has had to make full preparation to that end.

While crying for peace to the outside world he has been steadily stimulating the war sentiment of his empire and educating his people to believe that they are invincible before the world and that the Supreme Ruler of the Universe is on the side of Germany.

After Napoleon really believed and dared to declare that there was but one ruler in Heaven and that there ought to be but one on earth it took some time to surround him at Waterloo.

In the case of the present German emperor the commerce and the material civilization of the whole world depends upon the battle soon to be fought in the North sea against the new imperial navy of Germany.

Of course, the war party of Austria never sent its ultimatum to Servia without the backing of the German emperor and the vital evidence in the situation is the completion of the Kiel canal.

Information reaches the Boston News Bureau that the deepening of the Kaiser Wilhelm canal running from Kiel on the Baltic to the North sea at the mouth of the river Elbe was substantially completed fourteen days before the beginning of the war.

This so-called Kiel canal is the vital feature in German naval strategy.

The original canal, which is 61 miles long, had a depth of 29½ feet and bottom width of 72 ft. and a surface width of 219 ft. The improvements which have been in process for five years and have been carried on without interrupting traffic were designed to give the canal a draft of 45 ft., a top width of 400 feet and a bottom width of 150 ft.

The new locks which are bigger than the locks of Panama are 1,082 ft. long, 147½ ft. wide and have a mean depth of 45 ft. of water over the sill. The new locks, one on each end of the canal, were built beside the older and smaller ones.

With this canal completed Germany is able to transfer the largest warships or merchant ships as well between the Baltic and the North sea.

The canal was originally built in 1895 at a cost of \$40,000,000. The improvements just finished have cost an additional \$55,000,000.—Boston News Bureau.

#### HILLCREST COLLIERIES.

Mr. J. M. Mackie, managing director of Hillcrest Collieries, states that the company is recovering from the effects of the disaster at the mines. Shipments today are 700 tons per day compared with 1,250 tons daily before the disaster. Shipments will be increased to 1,000 tons daily within the next two weeks.

#### PETERSON LAKE.

A dividend of 1¾ per cent. on the capital stock of the Peterson Lake Co., has been declared. It is payable on Sept. 2nd to shareholders of record at the close of business on Aug. 19.

D. Lorne McGibbon, who is an Honorary Lieutenant-Colonel of the 6th Brigade Canadian Field Artillery has more than risen to the occasion. He has made an offer to care for the families of all the men of the Brigade who are called to war.



# THE MILL AND METALLURGICAL PRACTICE OF THE NIPISSING MINING CO., LTD., COBALT, ONT.\*

By G. H. Clevenger.

This paper cannot fail to be of great interest and value to all who are interested in the cyanide process, on account of the important development which it records. Mr. Johnston is to be commended for the large amount of detail which he gives, and the company and its management for permitting the publication of data of this character, which while of great value to others could well be considered private property.

It might be discussed from a number of standpoints: First, as an example of recent practice in mill and cyanide plant construction; second, the mill practice; third, the cyanide practice; and fourth, the new features in cyanide treatment involved. Perhaps a more vivid way of expressing it would be: First, the equipment or tools with which the various operations are carried on, are they the best and most efficient which could have been selected for their respective uses; and, second, is the best use in every case made of these tools? It may be well inquired is the highest possible recovery of silver made at the lowest cost per ounce recovered? For the making of the greatest ultimate profit is inseparably associated with successful metallurgical practice. There must therefore be at all times a careful balance maintained between recovery and cost of obtaining it.

I wish to call attention in a very general way to the equipment used and to an anticipation of questions which are bound to arise in this connection. However, the bulk of my discussion will be confined to the presentation of certain additional data, together with a more or less general discussion showing the line of development which leads up to the present practice and the applicability of certain features of it to similar problems elsewhere.

There are a number of vital points of broad general interest involved in Nipissing low-grade practice upon which metallurgists will by no means be agreed to. I wish to call particular attention to these points in the hope that it will lead to the presentation of data by others of practice in other districts which will assist in reconciling this divergence of opinion.

**Crushing equipment.**—It will be noted that the crushing equipment closely follows recent South African practice. The use of a sillex lining in the tube mills might be questioned from the standpoint of economy; but quite aside from this point, upon which I am not prepared to give authoritative data, there are perhaps two distinct advantages possessed by this type of lining in this particular case. With the very fine grinding practised at this plant there would be, with iron or steel liners, a much larger proportion of finely divided iron in the pulp. My experience with the treatment of the high-grade ore showed that the presence of iron interfered with the extraction of the silver. It is also a well-known fact that metallic iron in an extremely finely divided state may cause an important cyanide consumption. The installation of the old type of mechanical agitator will be questioned by many operators, particularly as there is an air lift used in each tank in addition to the mechanical stirring gear.

**Filtration.**—There has been considerable misconception regarding the character of the low-grade ore, and

certain writers have made rather sweeping statements regarding the non-suitability of Cobalt ores for vacuum filtration, presumably upon the assumption that the low-grade ore had a heavy gangue similar to the high-grade ore. The specific gravity (2.70 to 2.72) of the low-grade ore is not very different from that of the siliceous ores of other districts. My own experience in making the large-scale tests was that it was a most favorable ore for vacuum filtration. This statement I do not wish misconstrued as meaning that the vacuum type of filter is unqualifiedly the best for Cobalt ores for so far as I am aware comparative tests of the different types of filters have never been made in this district.

**Early methods.**—Briefly the status of metallurgical practice in the Cobalt district at the time that we began the investigation of the treatment of Nipissing ores was as follows: The high-grade ore was separated by sorting and piggings at surface plants, and sold to smelters outside the district, there not being up to the time of the advent of the Nipissing high-grade mill any of this ore treated locally. The low-grade ore, the dumps, and the low-grade material taken directly from the mine, was originally treated exclusively by concentration, the concentrates being sold to smelters. Later certain of the concentration mills provided cyanide annexes for the purpose of making a further saving from their tailings. Then came the building of mills which were primarily cyanide plants in which concentration was to be depended upon for the removal of the refractory minerals, and the major portion of the silver recovered as bullion through the medium of the cyanide process.

While the mills using the cyanide process unquestionably made a higher ultimate recovery, the mills which had confined their efforts to the development of their concentration practice, although realizing a lower recovery, appeared to be making as great and in some cases a greater ultimate profit than the mills employing a combination process. In other words, the greater recovery, which necessarily required a greater capital expenditure, did not in all cases mean a greater ultimate profit.

**Improvements.**—Early in the course of our work we considered the treatment of the low-grade ore and in this connection made a number of small-scale tests. These clearly indicated that the ore could be treated by cyanidation, but they had not proceeded far enough for us to determine certain difficulties, and problems, which even at this early date, we were quite sure would arise on account of the experience of others in the district. At this time we had not worked up to the maximum extraction or assured ourselves that concentration could be dispensed with. It might be mentioned that from the first we were determined to treat all the ore produced by the Nipissing company by hydrometallurgical processes and that nothing but refined silver was to leave the premises. Shortly after making the preliminary tests mentioned our efforts were centered upon developing the process for treating the high-grade ore. This fully occupied our time until late in the summer of 1911, when the treatment of the high-grade ore was upon a well-

\*A discussion presented at Salt Lake Meeting, A. I. M. E., August, 1914, continuing the discussion of the paper of James Johnston, presented at the New York meeting, February, 1914. and printed in Bulletin No. 85, Jan., 1914, pp. 107 to 133.



established commercial basis, and we again turned our attention to the treatment of the low-grade ore. After a thorough study of the practice and results of other mills in the district, the management and ourselves were unanimous in the opinion that the issue lay squarely between the relative economy of straight concentration and a process, preferably as near straight cyanidation as possible, which would produce only refined silver.

**Objections to combination process.**—The middle ground involving concentration and cyanide treatment did not appear attractive for various reasons. The object of concentration in cases where it is practised in conjunction with the cyanide process is to recover gold and silver and not soluble in cyanide solution, or to remove interfering elements, but experience shows it to do this but imperfectly, and further, it invariably removes gold and silver which are readily soluble in cyanide solution, which could be to better advantage dissolved by the solution and recovered as bullion. In cases where it is feasible to concentrate after cyanide treatment this last objection of course is not valid; but this cannot be readily done for it means repulping of the tailing and provision for a regular feed to the concentration devices. Moreover, the conditions of fine grinding which make for the best results in cyanide treatment are not those most conducive to the best work in concentration. A more or less complete concentration plant means a greater capital expenditure and it further means the control of two separate operations which involve entirely different principles and methods of operation. Generally you are attempting to operate a concentrator and a cyanide plant with neither up to full efficiency. The conditions of the two processes are therefore at variance and it is the constantly growing opinion that concentration in connection with cyanide treatment should only be turned to as a last resort.

**Many small-scale tests** were made involving various combinations of treatment. The results of these, together with the other data which had been collected in the district, led us to make the first large-scale tests along rather conservative lines, particularly as regards the removal of the native silver and dyscrasite. The preliminary examination of these ores indicated that the silver occurred in three general forms: First, native silver, of greater or less purity, and dyscrasite, which on account of their coarseness would not readily pass into solution; second, silver minerals readily dissolved by cyanide solutions; and third, some combination of silver which resisted ordinary cyanide treatment and was dissolved only after extremely fine grinding, and a long period of agitation.

**Large-scale tests.**—In order to show the general character of the low-grade ore, the results of four large-scale tests made upon lots of ore representative of the type of ore produced by the Nipissing company, and involving a total of about 36 tons are quoted from rather fully.

Each lot of ore was first sent to the sampler where it was weighed, crushed to 4-mesh and the assay sample separated. It was then transported to the point where the tests were to be made. It might be explained that these large-scale tests were run in the high-grade mill and the time available for them was determined by the time necessary to make certain necessary alterations and repairs to the mill. The tube mill had just been relined and therefor contained no amalgam. Agitator tanks, settler and other equipment were cleaned out very thoroughly and before running the tests proper, low-grade ore was passed through the entire system. I have every

reason to believe that in general there was no salting except in the case of perhaps four or five samples. At any rate, if there was any error the probability would be that the residues actually assayed higher than the true value, therefore the percentages of extraction noted would be lower than those to be expected in actual practice, when employing the same method.

The general method of procedure in each case was to grind the ore, two tons at a time, with a ton of solution, the proper amount of lime, and a part of the cyanide, for a period of four hours. The time of grinding has been previously determined by grinding a sample of the ore in the tube mill for varying lengths of time and making sizing tests. The aim was to have practically everything pass a 100-mesh screen. This method of unit grinding had to be adopted on account of there being no arrangement for the ordinary method of continuous feed and discharge. After grinding, each charge was dumped into a settler containing 522 lb. of mercury, and after each charge the tube mill was rinsed out with cyanide solution which was also allowed to run into the settler. The oak-shod muller was raised well above the bottom of the settler so that there would be no grinding effect upon the mercury. Each charge was agitated in the settler for a period of one hour. It will be noted that no mercury was used during the grinding. The idea was to give an opportunity for any particles of metallic silver or dyscrasite, which might have resisted grinding, to settle out so that they would not be carried down into the treatment tanks where they would cause trouble. The mercury at the bottom of the settler simply acted as a collector for these particles. Particles of native silver and dyscrasite fine enough to remain in suspension in the pulp during agitation were assumed to be fine enough for satisfactory extraction by solution in cyanide. My idea of this operation was that it was a mechanical method, involving settling rather than amalgamation, of separating a portion of the silver which would either not be dissolved in the treatment tanks or would require an undue amount of grinding to reduce to a state of subdivision fine enough to be readily dissolved. After agitation in the settler the pulp was drawn off into agitator tanks of the ordinary mechanical type fitted with means of introducing air and so connected that the charges could also be agitated with a centrifugal pump. The process of the treatment was recorded by determinations made upon samples taken every six hours. The effect of various forms of agitation was studied and in this connection pump agitation was found to be the most effective for the refractory silver minerals which dissolved very slowly at the last. A small amount of air was introduced during the whole agitation period. Pump agitation was not resorted to until at the last.

**Distribution of the Silver.**—The following assays of the four lots of ore treated show the distribution of the silver:

	Lot A	Lot B	Lot C	Lot D
	oz.	oz.	oz.	oz.
	per ton	per ton	per ton	per ton
Pulp. . . . .	29.70	30.10	47.80	27.10
Metallies on 100 mesh	0.01	0.01	0.16	0.05
Metallies on 20 mesh.	....	....	0.19	0.07
Metallies on 8 mesh..	4.18	3.23	5.29	2.79
Metallies on 4 mesh..	1.24	1.33	0.46	0.98
Commercial assay ...	35.13	34.67	53.90	30.99
Correction on pulp..	1.30	2.00	2.90	1.10
Corrected assay . . . .	36.43	36.67	56.80	32.09



**Composition of Low-grade Ore.**—The following analysis by James Denny of a sample of the low-grade ore will show its general composition.

Per Cent.		Per cent.
Silver.....	0.106	Lead. . . . . 0.064
Copper.....	0.270	Calcium oxide . . . . . 9.020
Arsenic.....	1.880	Magnesium oxide . . . . . 4.330
Iron.....	1.920	Aluminum oxide . . . . . 10.030
Sulphur.....	0.640	Carbon dioxide . . . . . 11.060
Bismuth.....	0.010	Mercury. . . . . trace
Nickel and cobalt.	0.730	Insoluble. . . . . 59.840

An analysis made by Johnson and Sons upon a sample of the residues from the high-grade ore, shows antimony 3.8 per cent., bismuth 0.09 per cent., tellurium 1.39 per cent., and traces of tin, zinc, and manganese. These elements are all undoubtedly present in the low-grade ore as there is, unavoidably mingled with it, more or less high-grade ore.

I have also observed the presence of a small amount of graphite in Nipissing ores.

**Extraction.**—The extraction of the silver by settling averaged 46.7 per cent., and the total extraction by settling and cyanide treatment at the end of four hours of grinding and one hour of settling, averaged 66.5; 19.8 per cent. of the silver was dissolved during this period by cyanide. At the end of the first six hours of agitation, the total extraction had reached 76.3 per cent. At the end of the next 30 hours of agitation or a total agitation period of 36 hours, the extraction was 87.6 per cent. To raise the extraction 4.2 per cent. or to reach a total extraction of 91.8 per cent. required a long additional agitation period. Of the 8.2 per cent. of silver remaining after long-continued agitation, 3.7 per cent. was soluble in hot dilute nitric acid. The average total percentage of silver which could be extracted by combined settling, cyanide treatment, and dilute nitric acid was 95.5 per cent. The proportion of silver extracted during four hours of grinding and one hour of settling with lots C and D, which were similar in character, was considerably higher than with lots A and B, but the extraction curves for C and D as the cyanide treatment continues, straighten out and soon fall below the curves for A and B. A continued slow increase in extraction was particularly noted with lot C, which contains a somewhat higher proportion of silver. The peculiar character of these extraction results is doubtless due, at least to a certain extent, to the presence of a large proportion of dyscrasite, the coarse portion of which settles readily, while the finely divided portion dissolves very slowly in cyanide solution.

**Fine Grinding.**—Although these results clearly indicated that a cyanide plant would be most advantageous, it was the general concensus of opinion that more experimental work should be carried on to simplify and improve the process, if possible. From the first, there was a strong prejudice against the use of mercury in the low-grade mill. This is best appreciated by those who have had experience in handling large amounts of mercury in mill practice. Although certain of my early small-scale experiments had not been very promising when it was attempted to treat the whole ore directly by cyanidation, Mr. Butters strongly adhered to the idea of grinding the whole ore, native silver, dyscrasite, etc., to such a degree of subdivision that all the silver could be dissolved by cyanide. Tests were accordingly made in this direction, and through the guidance of Mr. Butters, gradually led into the present system of treatment where the same idea of grinding the native silver and dyscrasite to a state of subdivision such that it can be

dissolved by cyanide solutions is practised, the desulphurizing treatment being only effective in altering the sulphides and sulpho-antimonides.

Now I wish to make this point very clear, for this problem of handling metallic gold and silver in ores which are cyanided, is one that has often perplexed metallurgists and one that has resulted in a variety of solutions. The usual answer to this problem although other methods have been used, is either amalgamation or concentration. On the one hand, we have Mr. Butters who has taken the extreme view that an ore containing native silver and dyscrasite, some of which will remain upon a 4-mesh screen, can be ground and cyanided direct, on the other hand, we find some metallurgists amalgamating comparatively low-grade gold ores preliminary to cyanide treatment, where the actual weight of metallic gold to be ground would be many times smaller than the weight of the metallic silver in Nipissing ore and everything considered much easier to grind and dissolve than Nipissing silver.

Mr. Butters has demonstrated that his plan is possible with Nipissing ore, for the results being obtained in the mill bear testimony to that fact; but quite naturally, it will be asked at what cost? Is the ore ground excessively simply that the more resistant metallic silver and dyscrasite may be reduced fine enough to pass readily into solution and the whim of recovering everything by cyanidation be satisfied? It is true of course that selective grinding can be practised to a considerable extent with heavy brittle minerals, but this is less true of the metallic silver and dyscrasite of Nipissing ore. By selective grinding, I mean grinding of an ore consisting of a relatively light gangue and a heavy brittle mineral so that the mineral becomes more finely divided than the gangue. This automatically takes place in a closed circuit of classifiers, other than screens, and a tube mill. This often causes a mineral to be ground down sufficiently fine for satisfactory extraction of gold and silver without excessive grinding of the gangue.

As a result of the first experiments which were made upon this ore, I called particular attention to the necessity of extremely fine grinding and this point has been confirmed by all who have since investigated its treatment. Now bearing in mind the necessity for this extremely fine grinding, presumably for certain of the brittle silver minerals, it is readily conceivable that when this necessity for fine grinding is satisfied in a closed circuit of tube mills and classifiers, all of the metallic silver and dyscrasite will also have been reduced to a degree of subdivision, such that it readily passes into solution. After all, Mr. Butters may be right in this case, due to the formation of the ore by "Dame Nature" to fit his metallurgical ideas, or he may have recognized this peculiarity from the outset, and as all wise men should do, has taken advantage of it. Under other conditions than those which *possibly* obtain with Nipissing ore, such a procedure could readily lead to poor economy through the excessive grinding of worthless gangue in order that metallic gold or silver might be dissolved by cyanide solutions, and other methods of recovery dispensed with.

The so-called desulphuring process is of interest as being the first large-scale application of the use of a reducing agent to effect certain chemical changes prior to cyanide treatment. To the thinking operator, it is indeed refreshing in this day of excessive oxidation and aeration in cyanide treatment to note that at times there may be virtue in reduction. I might mention that this mania for oxidation has even gone so far that



certain operators have aerated their pregnant solutions prior to precipitation. When it is remembered that precipitation is distinctly an operation of reduction, the fallacy of this course is apparent. That the deleterious effect of air upon precipitation is no mere theory, will be confirmed by operators using zinc-dust precipitation who have experienced air leaks in the suction of their precipitation pump.

The idea of using a preliminary treatment involving the use of aluminum and caustic soda in connection with the treatment of precious metal ores, is by no means new or original as many have supposed. Over 10 years ago W. Walker published an account of experiments made in this direction by himself and Martin. As cyanide operators generally are not familiar with this work, I will quote from it at some length.

"In an experiment designed to determine the effect of chlorine and cyanogen at the moment of liberation at the anode, ore was spread on a piece of platinum foil immersed in a solution of salt and potassium cyanide. The electrode intended to act as cathode was suspended from above. Through an error the feed wires were crossed and the platinum plate on which rested the ore was made the cathode. Almost immediately after turning on the current a purplish-red color was observed around the plate and subsequently a black cloud was thrown off. Upon removing the ore the gold was found securely plated upon the platinum, while the black cloud, when collected and analyzed, proved to be tellurium. To prove that the anions Cl and CN played no part in the reaction, caustic soda was substituted as electrolyte and identical results obtained. Evidently the gold was being recovered by cathodic reduction alone. It was found, that in general, any method which subjected the telluride to the action of nascent hydrogen in an alkaline solution would effect the reduction; or to put it differently, whenever gold telluride in the presence of alkali came in contact with a metal from which hydrogen was being liberated, tellurium was set free, metallic gold appearing on the metal. Thus for example, when powdered telluride is placed upon metallic aluminum and moistened with caustic soda decomposition immediately takes place. The same is true of zinc, although the reaction is much slower. Sodium amalgam breaks up the grains of telluride with great ease. When an electric current is used the reaction seems to be independent of the metal forming the cathode, and to take place in any neutral or alkaline solution.

"When a dilute acid was used as an electrolyte a reduction of the gold was effected with the greatest difficulty. Only by employing a very dilute acid and a large current density could any apparent decomposition be obtained.

"A possible explanation of the reaction taking place is the following: The hydrogen evolved first untied with the tellurium, forming hydrogen telluride and free gold. In the presence of alkali this compound is immediately broken up with the formation of an alkaline telluride which is easily soluble, and thus removes the tellurium from the sphere of action. This alkaline telluride is in turn oxidized with the formation of free alkali, and metallic tellurium. In the presence of acids, however, the hydrogen telluride is immediately broken up and the free tellurium deposited *in situ*, as it were, upon the gold, thus protecting it from further action. This is indicated by the fact that a silver-white piece of gold telluride becomes black when placed upon the cathode in an acid electrolyte, and also by the fact that when the amount of activity of the acid is decreased by diluting

the solution a slight deposition of gold can be obtained.

"When the rate of decomposition is rapid the gold in the small pieces of mineral is not evenly deposited, but frequently retains the original shape of the mineral fragment.

"Quantitative runs were made on a rather rich sulphotelluride with caustic soda as electrolyte, and mercury for the cathode. By maintaining gold agitation it was not difficult to obtain an extraction of 93 per cent. of the assay value. The presence of finely divided tellurium in the electrolyte seemed to cause excessive flowering of the mercury and much trouble was experienced from this cause. When lead or other solid metal was used as cathode much gold was lost by the abrasion of the moving ore.

"Good results were also obtained by agitating the ore with aluminum shavings in the presence of caustic soda solution, washing out the tellurium and amalgamating the free gold."

(To be continued.)

### NOMENCLATURE OF ALLOYS.

At the annual general meeting of the Institute of Metals, held in London on March 18th, 1914, a committee consisting of representatives of The Institute of Metals, The Institution of Mechanical Engineers, The Institution of Electrical Engineers, The Institution of Naval Architects, The Institution of Engineers and Shipbuilders in Scotland, The Northeast Coast Institution of Engineers and Shipbuilders and The Society of Chemical Industry, (Chairman, Dr. W. Rosenhain, F.R.S.), presented a unanimous Report in which they recommend the adoption, first of a systematic nomenclature in which alloys are denoted by the names of their constituent metals in English, arranged in increased order of percentage present in the alloys. This systematic nomenclature is intended chiefly for scientific and other purposes where its precise character more than outweighs its cumbersome. The committee next recommends that a system of "practical" nomenclature should be set up consisting of "practical" names which are to serve as everyday abbreviations of the systematic or scientific names. The definition of current practical names on this basis has so far only been attempted in regard to the two important terms "brass" and "bronze." The definition of "brass" adopted by the committee is that it is to be used as an abbreviation of the words "zinc-copper" as employed in the systematic nomenclature; when employed alone it indicates that the alloys are pure zinc-copper. Where the presence of other metals is to be indicated their names are to be prefixed to the term, forming such words as tin-brass, aluminum-brass, manganese brass, etc. Similarly the term "bronze" is defined as an abbreviation for "tin-copper" as used in the systematic nomenclature, the definitions in other respects being identical as that for "brass." The committee is not yet prepared to recommend definitions of further practical terms, but the two terms defined represent the most widely used alloys, and their general adoption as thus defined would do much to remedy the state of confusion which exists at the present time. The committee, therefore, appeals to all those interested in the progress of the industries and sciences connected with metals to use their best endeavors to support and carry out the recommendations of the committee.



## PERSONAL AND GENERAL

Mr. Ralph Arnold, of Los Angeles, California, geologist and petroleum engineer, has been examining lands in the Flathead country, Southeast Kootenay, owned by a British Columbia company, and believed to be oil-bearing.

Dr. Alfred H. Brooks, geologist in charge of the work of the United States Geological Survey in Alaska, was in Seattle, Washington, about the middle of July, on his way north. His season's itinerary in Alaska includes visits to Valdez, Chitina, Ruby, Iditarod and Nome. He will not return until the autumn.

Mr. C. P. Browning, one of the Britannia and Smelting Co.'s mining engineers, was among the British Columbia visitors to the campus of the University of Washington, Seattle, at the time of the State-wide Mine-rescue and First-aid demonstration held there on July 22 and 23.

Dr. C. W. Drysdale, of the Geological Survey of Canada, has completed his work in Rossland camp, and has gone to Ymir, in Nelson mining division of West Kootenay, to study the ore deposits of that camp.

Mr. Charles Graham, superintendent of the Corbin Coal and Coke Co.'s colliery in the southeastern part of the Crownsnest district, B.C., has been spending a short vacation at Nanaimo and Victoria, Vancouver Island, B.C.

Mr. Thomas Graham, of Victoria, Chief Inspector of Mines for British Columbia, while attending the Mine-rescue and First-aid demonstration held at Seattle, Washington, on July 22 and 23, under the auspices of the United States Bureau of Mines, acted as judge of the contests in Mine-rescue events. At the request of the committee, Mr. E. Jacobs, who was also a visitor from Victoria, was official scorer throughout the two days' meeting, which was attended by more than 50 competitors in the various events and numerous friends from different parts of the State.

Mr. John Hopp, who is the largest hydraulic mining operator in Cariboo district of British Columbia, after having been detained at the Coast owing to non-receipt of a lot of casing required for use in testing the gravel at "the Meadows" on Williams creek, near Barkerville, where drills are being operated to determine the suitability or otherwise of the ground for gold-dredging purposes, has gone to Cariboo to keep in touch with work on his several hydraulic placer mines being operated near Barkerville.

Mr. Randall H. Kemp, a pioneer of Ainsworth, Slocan and Nelson districts, in British Columbia, and later mining journalist and frontiersman in Alaska, is a patient in the Royal Jubilee Hospital, Victoria, undergoing radium treatment for a cancerous affection of his tongue.

Mr. J. D. MacKenzie, of the Geological Survey of Canada, and Professor V. Dolmage, of Columbian College, New Westminster, B.C., are reported to have been injured by an explosion of natural gas at an old coal prospect at the southern end of Graham island of the Queen Charlotte group, British Columbia. Prof. Dolmage was spending a vacation with Mr. MacKenzie, who was studying the coal deposits of Graham island. A newspaper account of the accident says: "Accompanied by Mr. MacDonald, resident engineer at Wilson camp, where exploration is in progress, Messrs. MacKenzie and Dolmage went to examine an exploratory working to the south of Queen Charlotte City. Almost immediately after the party entered the work-

ing with lighted candles they were hurled backward 30 ft. and covered with debris. Two were under fallen rock, and they were dug out and assisted to the hospital. All three suffered severe cuts and bruises, but they are now out on crutches."

Mr. Frank E. Pearce, formerly of Baker City, Oregon, who was last year in charge of development work at the Inland Empire mine, in the western part of Trail Creek mining division, B.C., is now directing development work on the Pingree, in Nelson division.

Mr. Robert T. Turner, of Nevada, was in San Francisco recently, after having been in British Columbia for men interested in mining property in that Province.

Mr. C. S. Verrill, of Vancouver, B.C., has been assisting Mr. A. G. Larson, who was employed by the Department of Mines of British Columbia to make an investigation of the ore production probabilities of Franklin camp.

The American Association of State Geologists will hold its first annual summer field meet in Michigan, Aug. 27 to Sept. 1.

The Herbert Morris Crane & Hoist Co. has issued bulletin Z13, describing a small telescopic hoist.

The Salt Lake meeting of the American Institute of Mining Engineers, was held August 10 to 14. A series of papers of unusual interest to metallurgists was presented.

### LIEGE.

Strategic points in the importance of Liege, the Belgian city before which the German advance is reported to have been checked, and where, according to European dispatches, the first great battle in force of the impending war may be fought, are numerous, says the New York Journal of Commerce. Principally it is the most strongly fortified obstacle to the supposed plan of the Germans to cut across the lower half of Belgium into French territory, but in addition to this the city is of itself a prize in many ways.

In its surroundings it is the Pittsburg of Belgium. For miles to the southeast of the city, along the banks of the river Meuse, there are scores of blast furnaces, puddling furnaces, rolling mills and forges. It is the site of the famous Corkerill works, said to be the largest manufactory of machinery in the world. The Lion, erected as a monument on the field of Waterloo, some sixty miles distant, was made here.

Liege proper, with a population of 168,000, lies at the junction of the Meuse and the Ourthe, in a basin margined by hills. Many handsome buildings and gardens strive to keep themselves handsome against the tremendous odds of coal dust. All around the city is a wealth of coal and iron ore; the mines are run even under the city and river. These natural riches, in connection with the favorable situation of the city at the junction of two navigable rivers, have given rise to the extensive manufacturing industry in the city itself.

The products are varied, but the principal one, and that which would make Liege a valuable prize of war, is that of firearms. More than 20,000 persons in and around the city are employed in the manufacture of guns, ranging from small arms to the largest modern weapons. There is a royal cannon factory and a small arm factory also in the suburb of St. Leonard.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA

Reports received from the more important mining district of the Province are generally favorable as regards metalliferous mining, but less satisfactory where coal mining is concerned. From the placer gold camps of Cariboo and Atlin the news is, in effect, that having a sufficient supply of water for gravel-washing, there is the customary summer activity, with a fair amount of gold being reecovered. It is not the summer operations, however, that usually determine whether the full season's results are good, but those of the autumn. If much rain falls after the summer water supply from melted snow has been exhausted, and before the early frost comes, then the year's placer mining is prolonged proportionately, but when a dry autumn is experienced a short hydraulicking season results, and the gold yield is adversely affected ac-

curring in these mines, a much larger weekly output could easily be maintained, but pending the discovery of a process suitable for treatment at low cost of zinc-lead ore that cannot now be shipped to United States zinc reduction works at a profit, ore of this class must be left in the mine. Exploration of new ground in the St. Eugene mine is being continued, meanwhile occasionally a car of ore is shipped to Trail, rather more than 700 tons representing the output for the first half of this year. District newspapers report new discoveries of placer gold on two streams, and in Fort Steele mining division a resultant staking of a number of placer claims.

#### West Kootenay.

**Ainsworth.**—The greater part of the ore production of this division is still that of the Highland and No. 1 silver-lead mines, both operated by the Consolidated Mining and Smelting Co., and the Bluebell mine, situ-



Unloading Oil Well Supplies at Okotoks, Alberta

cordingly. The accounts thus far brought to the larger cities of the Coast have told of operations being actively carried on, and expectations general of a good season. Whether the latter will be realized remains to be seen. Lode mining in Kootenay, Boundary and Coast districts appears to be progressive, and since it is from these districts that practically all the ore produced is mined, the outlook for the year's total production from lode mines seems to be good.

#### East Kootenay.

There has been a substantial increase in the quantity of lead ore shipped during recent weeks from the Sullivan Group mines to the Consolidated Mining and Smelting Co.'s smelting works. The total quantity of Sullivan ore received at Trail during 26 weeks ended July 2 was 10,063 tons, an average of 387 tons a week. The quantity for four weeks ending July 21 was 3,682 tons—an average of 920 tons a week. Twice during that four-week period the weekly total was in excess of 1,000 tons—for the week ended July 2 it was 1,018 tons, and for that of July 16 1,012 tons. If it were practicable to also utilize the zinc ore

ated on the opposite side of Kootenay lake to the town of Ainsworth. All three mines are regular producers. The Consolidated Co. is also working the Banker and Maestro mines, and making small shipments of ore from them now and then. Other mines in this camp are the Silver Hoard and the Florence Co.'s group, both held by Spokane men; these properties are expected to be on the list of shippers before the end of the ensuing autumn.

The completion of the work of reconstruction of the Kaslo and Slocan Railway from Kaslo to Whitewater has provided transportation facilities for mining properties on the south fork of Kaslo river, the Utica mine, a few miles farther west, some claims in Jackson basin, from which a small quantity of zinc ore has been shipped recently, and several mines in the neighborhood of Whitewater. There is now railway connection without break from Kaslo, on Kootenay lake, past New Denver and Rosebery on Slocan lake, and through to Nakusp on Upper Arrow lake, Columbia river.

**Slocan.**—The Rambler-Cariboo mine and concentrator are being operated to present capacity of the mill.



Particulars of this property were printed in the Journal of July 15 (p. 480). Deep level exploration work in the Payne mine has not yet resulted in discovery of much ore; it is probable that connection will be made between the low level adit and the workings 600 to 700 ft. above, and the ore shoot opened in the old 800 ft. level be followed down. If the suggested connection be made, both good ventilation and drainage will be established, and development from the old workings downward be made much less difficult than under present conditions. Progress at the Slocan Star mine and mill is reported to be satisfactory, for much of the concentrating ore opened by the development work of the last year can now be turned to profitable account. The quantity of silver-lead ore, suitable for shipment in its crude state to the smeltery, taken out in the course of development, has not been large, receipts at Trail from this mine having averaged only about 100 tons a month during the seven expired months of the current year. However, with the mill running steadily, an output of both silver-lead and silver-zinc concentrates is being made continuously. The latter product is shipped to Bartlesville, Oklahoma, U.S.A., for treatment there.

Other mines in the neighborhood of Sandon also being worked are the Richmond-Eureka, Ruth-Hope and Wonderful, and several properties on which lessees are at work; each of these groups mentioned has sent 250 to 300 tons of silver-lead ore to Trail during seven months, but the total from all other properties not included in the foregoing notes has been small. Near Cody, the Surprise is the most active, having shipped approximately 500 tons of silver-lead ore this year to date, and stored a lot of lead-zinc ore for concentration whenever facilities for treatment of this ore shall be provided. It is stated that arrangements are being made for shortly putting in a concentrating plant, much ore of milling grade having been opened in the mine during the last year. Driving the deep level crosscut adit on the Noble Five group is being continued, and prospects are reported to be good for this work proving of much importance, for there are several known ore-bearing veins to be cut by the adit. Lessees of a part of the Reco property are stated to have found another shoot of ore of shipping grade. Work has been resumed on the Noonday. Lessees of a part of the Idaho-Alamo group are busy now that the snow has melted. Progress with development of the Apex, near New Denver, and on the Hartney and Capella properties, represents the chief mining activity of that part of Slocan district. In Silverton camp, back from Slocan lake, the Standard Silver-Lead Mining Co. is a long way in the lead, with an output of ore for the year to the end of July much in excess of the combined production of all other Slocan mines in the same period. Shipments of silver-lead ore and concentrate to Trail for seven months have totaled approximately 9,000 tons, beside which there has been a considerable quantity of silver-zinc concentrate shipped to United States zinc reduction works. The Silverton Mines, Ltd., is continuing its efforts toward making a steady output of high-grade crude silver ore and both lead and zinc of concentrates. The expectation is that 150 tons of ore a day will be regularly sent down from the Hewitt-Lorna Doone group of mines, and that the mill will be found equal to treatment of that quantity. Shortness of ore at the Van-Roi mine recently necessitated a temporary suspension of milling operations, but development work in progress is expected to bring about an early return to

normal conditions. Work is being continued on the Lucky Thought, near Four-mile creek, and local men have arranged to reopen the old Wakefield mine, which in past years was a profitable ore-producer. Lower down the lake, the Eastmont, on Ten-mile creek, and the Ottawa, on Springer creek, and several other properties in Slocan City division, are being worked.

**Nelson.**—With the exception of that of the Silver King mine, which is being operated by the Consolidated Mining and Smelting Co., little ore has been shipped from mines near the town of Nelson during recent months. However, that mine has made a much larger production this year, for its output for seven months shows a total of about 12,000 tons, as compared with 3,780 tons for the whole of 1913. The Eureka and Queen Victoria copper mines and the Granite-Poorman gold mines are inoperative now. Work is being continued at the Venus, California and Perrier, and quite lately men were put on to further develop the Pingree. Farther afield, the Molly Gibson is again giving employment to a number of men, repairs to aerial tramway and other plant damaged by winter snowslides having been effected. While there is production in Ymir camp, development work has opened much ore in the Wilcox, Dundee and Yankee Girl mines, and several prospects in the neighborhood are promising. Shipments of lead ore from the Emerald, H. B. and Zincton mines, within a few miles of Salmo, received at Trail this year to July 21, total 3,039 tons, in the following proportions: Emerald 1009 tons, H. B. 1,674 tons, Zincton 356 tons. Gold-bearing ore is still being mined on the 600 ft. level of the Queen mine, Sheep creek, where there has been opened a shoot of ore 25 to 30 ft. in width and already stoped along a distance of 60 ft. The Motherlode mine and stamp mill are being operated as usual, a reserve of ore having been made during the latter part of the winter when the weather was too cold for the water-power plant of the mill to be run; development work is being continued in the deeper parts of the mine, to add to the supply of ore. Prospecting is being done on several other claims in Sheep Creek camp, but no ore from them is being either milled or shipped to the smeltery. In Erie camp the Second Relief is being worked and the ore taken out put through the stamp mill.

**Rossland.**—The only present productive mines in Trail Creek mining division are those at Rossland, namely, the Consolidated Mining and Smelting Co.'s Le Roi and Centre Star-War Eagle groups and the Le Loi No. 2 Co.'s Josie group. The approximate output of ore for the expired seven months of this year has been as follows: Centre Star-War Eagle group, 92,000 tons; Le Roi group, 40,000 tons; Josie group, 12,000 tons. These figures show the ore from these several mines received at the smeltery at Trail. The quantity of ore taken from the Josie group was larger than that shipped to Trail, but the lower grade ore was concentrated at the mine, and the product included in the total of ore shown above as having been shipped. All these mines look well for continued production. Much ore has been found on the 14th level of the War Eagle and work in progress on the 16th level indicates that the ore may be expected to continue to that depth at least. A fine shoot of ore is being explored in the Le Roi No. 2 Co.'s Annie claim from workings that are an extension of the Le Roi 1,650 ft. level; this shoot appears to come in from the Le Roi Black Bear claim, so most likely will be productive in that property as well.



**Lardeau and Revelstoke.**—Small shipments of ore are being made occasionally from the Ajax and another property of the Ferguson Mines, Ltd., but outside of these there are few productive mines in this district now being worked. The reports of a discovery of tin-bearing ore on a tributary of Fish river, 20 miles above Camborne, has been confirmed, but when the claim was visited the snow still covered the ground, so little could then be learned of the value of the find. Reports from the Big Bend of the Columbia, north of Revelstoke, are to the effect that a number of men are employed on one of the gold-bearing creeks and that prospects are favorable for good results being obtained.

**Boundary.**—There is little change in mining matters in this district. The Granby Co. is maintaining its output of between 3,000 and 3,500 tons of ore a day from its big copper mines at Phoenix. The British Columbia Copper Co. is stated to intend shortly closing its smelting works at Greenwood, but so long as it is keeping some of its furnaces in blast, local people are hopeful that operations will be continued despite reports to the contrary. Ore is being hauled to Lynch creek in wagons and thence by rail to one or other of the smelters; this ore is from the Union mine in Franklin camp, North Fork of Kettle river, in which part of the district prospecting is again active, and several finds of ore giving high assay returns have been reported lately. The Jewel gold mine maintains an output of about 1,400 tons of ore a month, and keeps its 15-stamp mill going continuously. There is some activity in the West Fork country, about Beaverdell and Carmi; ore is being treated at the Carmi mill and fair results are reported.

## COBALT, SOUTH LORRAIN, GOWGANDA

The outbreak of the general European war has had a most serious effect upon the Cobalt camp inasmuch as it has materially affected the price of silver. For a time, indeed, there was almost a panic here, but gradually as the worst effects were realized more sanity prevailed.

Three mines have closed down ostensibly for reasons connected with the war, all the others will remain open for a month or six weeks at all events, by which time the situation should have cleared and markets should again be available.

The reasons for the closing down of the Kerr Lake mine are not apparent. The Kerr Lake mine has made greater gains underground than any other property in the first six months of this year, and it has a good surplus. The action of the directorate in closing down is not connected with the camp in any way. The Drummond Fraction, which is partly under their control has also closed down. The Crown Reserve is keeping on all married men and gave single employees a week to find work, during which time they could stay in the company bunkhouses at the company's expense.

The Beaver has also closed down by order of the president, Mr. Frank Culver. Other mines have restricted operations, but none have closed down, and the situation now is much easier. There are, of course, many idle men around town.

The reassuring news that the British Government would take over and pay for all the silver that was in London and the resumption of quotations from London did much to bring the camp back to equilibrium. The United States is also taking a million ounces a week

for two weeks, which will help the situation greatly. A market is being sought and has been found via San Francisco to China. Two hundred thousand ounces was sold at current quotations via this source. There is also a project to arrange operations through New York. The scheme which has been outlined is that the ore should be treated in the camp at one of the custom smelters and shipped to New York, where it would be stored at the customer's disposal. In the meantime the banks concerned would advance the companies 25 cents an ounce, or a little better than working expenses for the silver, charging the current rate of interest. When quotation resumed or the markets opened or at the call of the customers they could get the bullion and sell it.

Probably the development which most alarmed the camp was not the cessation of the shipping of bullion, which was generally believed to be temporary, but the refusal of the one big smelting trust operating in the camp to take ore or concentrates. At first this trust stated that it would take the silver, pay 25 cents an ounce and settle for the rest when quotations were resumed. This was not entirely satisfactory to the producers, but all consideration of it was stopped when a message was received next day that the trust absolutely refused to take either ore or concentrates, and cancelled their contracts. The Canadian smelters at Thorold and Deloro are not taking on any further contracts, but they are carrying out those they have made already.

**The Huronian Belt Company**, which is taking over the Keeley on an option basis is pleased with the results obtained there to date. This last of the producers in the South Lorrain camp has six ore shoots underground ranging from a few feet long to 200 feet. A shoot from 150 to 200 ft. long has been developed on the Josey Wood's vein. The vein varies very materially both in width and values, but it is all high grade ore. It is in places six inches wide. A surface discovery has also just been made in the extension of an old trench. The vein had shown only cobalt ore with a low silver content in the old trench, but when it was followed up it was found to be quite rich and of considerable length. There was little doubt before the war broke out that the Huronian Belt would have taken advantage of the option. It is not quite known what will be done now. In spite of the fact that the Huronian Belt has large interests in Russia which will be materially affected the company has so much confidence in their investments in the north country both at the Keeley in South Lorrain, and at the North Thompson at Porcupine, that it has decided to keep the work going, though operations will be confined to places where it is most likely to be immediately productive.

**The ore shipments from the Cobalt camp** for the first week of the war, ending August 7, did not show any material decrease from the average, but they will be low this week. Bullion shipments have ceased altogether.

**The Cart Lake Cobalt Mining Company** working under the direction of the General Assets Company has let the sinking of a shaft on the Gould lease on Cart lake. This shaft is being sunk on the east side of the lake in ground which is quite unexplored as far as the Gould is concerned.

The Cart Lake company has cut the vein at the 332 ft. level, where it is an inch to an inch and a half wide of high grade ore. 741 pounds of high grade ore has been shipped to the Nipissing for treatment purposes.

**Casey.**—As a part of the general scheme of develop-



ment on the Casey Cobalt mine a shaft is being sunk on the east claim. This shaft is being put down in the clay in order to cross-cut a vein which has been found in a diamond drill core and appeared very promising.

**The Crown Reserve** has renewed the lease of the Silver Leaf, as it had the right to do under the original agreement. This agreement which was made on Dec. 4, 1909, was for five years on a royalty basis of 25 per cent., with an option for renewal of for five years on a royalty of 35 per cent., the lessee spending \$20,000 the first year and \$10,000 any succeeding years in work on the property. Mr. W. H. P. Jarvis was elected a director of the Silver Leaf at the recent annual meeting in Toronto.

**Bush fires** have done much damage to mining plants

**The Hollinger** has cut the main vein at the 675 ft. level, where it appears the usual grade of ore and about the same width. The extension to the mill should be running next week and the foundations for the 20 Acme stamps will be commenced at once so that the entire plant may be in operation early next year, probably February.

**The Tough-Oakes** had some delays in getting to work under the new and enlarged scheme of operations owing to various breakdowns at the Charlton plant. These have now been repaired. The English company controlling the Tough-Oakes, the Sylvanite and the Burnside has decided to keep the mine open and to rush work on all drifts and developments that promise immediate returns. Exploration work will be restricted until the horizon clears a little. The Tough-Oakes



Constructing New Power Plant for Hollinger and Acme Mines, Porcupine

in the Elk Lake camp. The plants of the Fleur de Lys, North American, Otisse, Motherlode and the bunk houses of the Mapes Johnston were destroyed.

## PORCUPINE, KIRKLAND LAKE AND SESIKINIK

All mines on a self supporting basis in the gold camp or camps of the north will be affected hardly at all by the European war, which is hitting all other industries so hard in the Dominion. The example par excellence is the Hollinger, where not a man has been laid off and the great scheme of development planned last month is being rushed forward with all haste. The McIntyre is also now on a self supporting basis. So are the Porcupine Crown and the Dome. As these four mines employ the greater part of the men in the camp the war in Europe will make very little difference to mining north of the height of land.

Other prospects not depending on the sale of stock or borrowed money for their operations will not be in the least affected and on the whole the depression and industrial stagnation characteristic of the country will find very little reflection in Porcupine.

mine has recently shipped 101,845 pounds of ore which will run over \$500 to the ton.

**Teck-Hughes.**—The Nipissing has already taken over the Teck-Hughes and a development scheme on a vigorous scale has been planned. So far only lateral development has been attempted. From this time forward all extension will be made to open up further levels.

## GOLD THIEF CAPTURED

The recovery of bullion and arrest of the thief who purloined \$4,000 worth of gold from a guard on the trail between Telegraph Creek and Deace Lake has been reported to Superintendent Colin Campbell, head of the Provincial Police Department by wire from Telegraph Creek.

The message stated that a Frenchman, named DeForrest, was captured on Saturday at a point twenty-six miles from Telegraph Creek, and that the prisoner had been brought into that place. All the gold was recovered. De Forrest had about seventeen ounces on his person when arrested, and the balance was found at a spot where the prisoner had cached it following the robbery.

**TORONTO MARKETS.**

Aug. 12—(Quotations from Canada Metal Co., Toronto)

Spelter, 5½ cents per lb.

Lead, 5 cents per lb.

Tin, 75 cents per lb.

Antimony, 25 cents per lb.

Copper, casting, 14¼ cents per lb.

Electrolytic, 14¾ cents per lb.

Ingot brass, yellow, 10; red, 13 cents per lb.

Aug. 12—Coal—(Quotations from Elias Rogers Co., Toronto).

Anthracite, \$7.50 per ton.

Bituminous, lump, \$5.25 per ton.

**METAL PRICES ADVANCE.**

Boston Aug. 10.

Sensational advances have been scored in metal prices during the past week.

Ferro-manganese now costs about \$125 a ton, whereas a week ago it could be purchased for \$38 to \$40 a ton. This metal comes from England for use in the steel industry.

Seventy-three cents a pound has been paid for tin in New York, as compared with a high record price of 63 cents established Thursday. Metal houses believe that not more than 20 tons of Straits tin could be bought in New York. They look for 75-cent tin, a hitherto unheard of price.

Antimony has advanced from 7 cents to 12 cents a lb. No large spot holdings exist in this country and the trade has become apprehensive as to when further stores will arrive from China.

The market for silver has disappeared, with no demand existing at the moment. Quotations have been discontinued. Predictions have been made by producers that the price will go to 60 cents an ounce as compared with 52 cents, owing to probable Continental demand for coinage.

A new high power water pump, with a capacity of 30,000,000 gallons a day, built by the Allis-Chalmers Co., was recently installed under the supervision of Mr. Wayne W. Mackey, erecting engineer of the company, at the Broadway pumping station of the Toledo Water Works, Toledo, Ohio. It has the distinction of being one of the greatest pumping engines of its class ever constructed, and cost \$83,000.

The pump is of vertical triple expansion design. All of the cylinders, heaters and steam lines connected with this giant pump are insulated with J.-M. coverings, furnished by the H. W. Johns-Manville Co.

At a meeting of the local organization of the United Mine Workers of America held at Nanaimo, Vancouver Island, B.C., on the night of July 20, the members were informed by letter from Frank Farrington, member of the headquarters executive board (and the one chiefly responsible for many of the island miners having gone on strike May 1, 1913, notwithstanding that in doing so a considerable number of them broke their agreements with the operators in leaving their work at that time), that no more strike money would be paid to the men on strike, owing to the unfavorable condition of the finances of the International union. An exception was made in regard to a sum of \$15,000 to be available for special relief in cases of emergency. The position of the strikers is a serious one, for only

one of the four companies operating on Vancouver Island has complied with the demands of the union, and that one, the smallest company. The other three have all the men they can find work for, and many others on their waiting list if at any time there are vacancies. The demand for coal is not now sufficient to keep all the mines working full time, the market having been partly lost to the island companies after the production of coal was stopped by last year's strike.

**ANGLO-FRENCH EXPLORATION CO.**

In our June 1 issue it was stated that the capitalization of this company is £15,000,000. We are advised by the Canadian representative of the company, Mr. J. B. Tyrrell, that the capitalization is £1,000,000.

**HOCK! DER KAISER.**

(This bit of doggerel, written by Rodney Blake and read publicly by the late Rear Admiral Joseph Bullcock Coghlan, U.S.N., in 1899, with the result that an international "incident" nearly followed, probably expresses the opinion of a large portion of the world's population concerning the present attitude of the German war lord.)

Der Kaiser of his faterland  
Und Gott on high all dings command,  
Ve two—ach! Don't you understand?  
Myself—und Gott.

Vile some men sing der power divine,  
Mine soldiers sing "Der Waecht am Rhine."  
Und drink der health in Rhenish wine  
Of Me—und Gott.

Dere's France, she swaggers all aroundt;  
She's ausgespielt, of no account,  
To much we dink she don't amount;  
Myself—und Gott.

She will not dare to fight again,  
But if she shouldt, I'll show her blain  
Dot Elsass und (in French) Lorraine  
Are mein—by Gott!

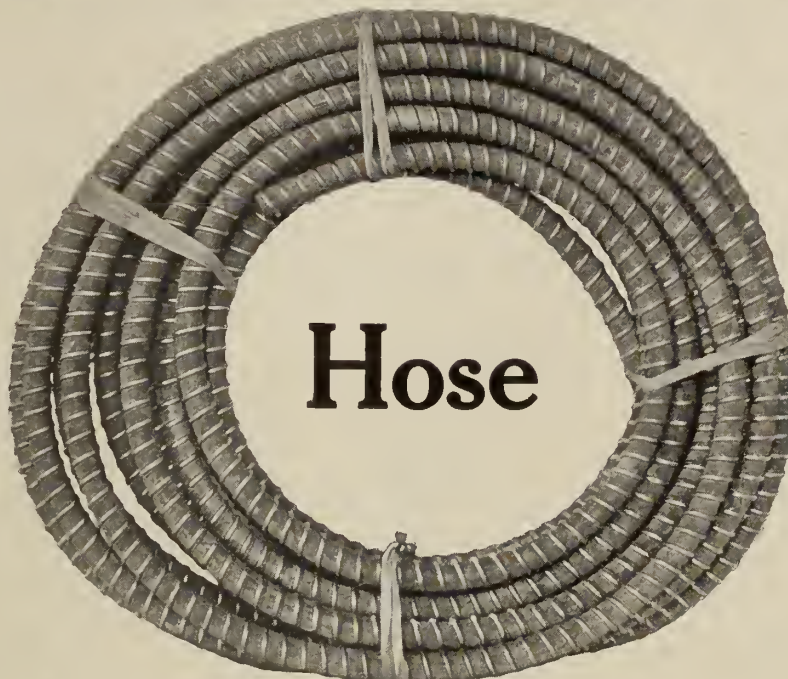
Dere's Grandma dinks she's nicht small beer,  
Mit Boers und such she interfere;  
She'll learn none owns dis hemisphere  
But me—und Gott.

She dinks, good frau, fine ships she's got,  
Und soldiers mit der scarlet goat.  
Ach! We could knock them! Poof! Like dot.  
Myself—mit Gott.

In dimes of peace, brepare for wars,  
I bear de spear und helm of Mars,  
Und care not for a thousand Czars,  
Myself—mit Gott.

In fact, I humor efery whim,  
Mit aspeet dark und visage grim;  
Gott pulls mit me, und I mit him,  
Myself—und Gott.





## For The Mine

In the mine Hose must stand unusual grueling service.

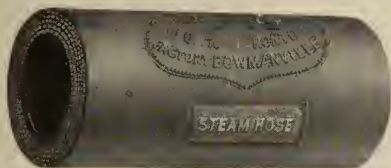
Not only must it stand high and intermittent internal pressures, but the rough handling it receives is hard on ordinary hose.

Hose to give unusual service must be made to more than measure up to unusual standards.

Hose bought on price is always the costliest hose. When such Hose gives out, it not only means the price of a new hose, but often the added and still more serious expense of a costly breakdown.

When you buy Hose, buy the Goodyear way. Put your Hose problems up to Goodyear efficiency experts. Let them tell you why the particular Goodyear Hose they recommend is exactly the Hose you need for the particular purpose. Buying Hose knowingly beforehand is real insurance. Hose made and bought on a service basis is always cheaper in the end than Hose made to meet a price.

**Use Goodyear Efficiency Service.** Whenever you need Hose, Belting or Packing, consult Goodyear efficiency experts. Remember that Goodyear leads in the Mechanical Goods Field, as in automobile tires. Asking questions costs you nothing. No obligation is involved. This forethought will save you money, time and trouble.



### "Black Diamond" Brand

Has a Marline woven jacket and different tube compounds for air and steam. The marline cover allows for even expansion and comfortable handling. This is a Hose made for honest service—a Hose that spells economy by reason of its durability



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Similar to Black Diamond, but made with a special steam, heat and oil resisting tube—a tube specially compounded so that it won't

cook itself to death like ordinary hose. Rapid hardening of the tube cannot occur.

Also comes wire wound. This means added durability where hose is roughly handled and used. The wire winding protects the outer cover. Keeps the hose intact under most grueling conditions.

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We are prepared to quote prices on complete elevating and conveying machinery whether chain, belt or spiral hangers, pulleys, shafting, bearings, belt, etc.

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

#### REPORTS RECENTLY ISSUED:

##### CANADA

1240. Victoria Memorial Museum Bulletin No. 1. Contains short scientific papers.

##### NEW BRUNSWICK and NOVA SCOTIA

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

##### QUEBEC

Memoir 43. St. Hilaire (Beloeil) and Rougemont mountains, Quebec, by J. J. O'Neill.

##### ONTARIO

Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

##### NORTH-WEST PROVINCES

Memoir 30. The basins of Nelson and Churchill rivers, by William McInnes. Map not published.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

##### BRITISH COLUMBIA

Memoir 23. Geology of the coast and islands between the Strait of Georgia and Queen Charlotte Sound, B.C., by J. Austen Bancroft.

Memoir 36. Geology of the Victoria and Saanich Map areas, Vancouver Island, B.C., by Chas. H. Clapp. Maps not published.

##### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

#### MAPS RECENTLY ISSUED:

##### CANADA

Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

##### NEW BRUNSWICK AND NOVA SCOTIA

Map 26A. Bathurst and vicinity, Gloucester County, New Brunswick. Topography.

Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.

Map 39A. Geological Map of Nova Scotia.

##### QUEBEC

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Map 100A. Bell River, Quebec. Geology.

##### ONTARIO

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Map 104A. Thompson River Valley, below Kamloops Lake, British Columbia. Geology.

Map 106A. Groundhog coal field, British Columbia. Geology.

##### YUKON AND NORTH-WEST TERRITORIES.

Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

**NOTE.**—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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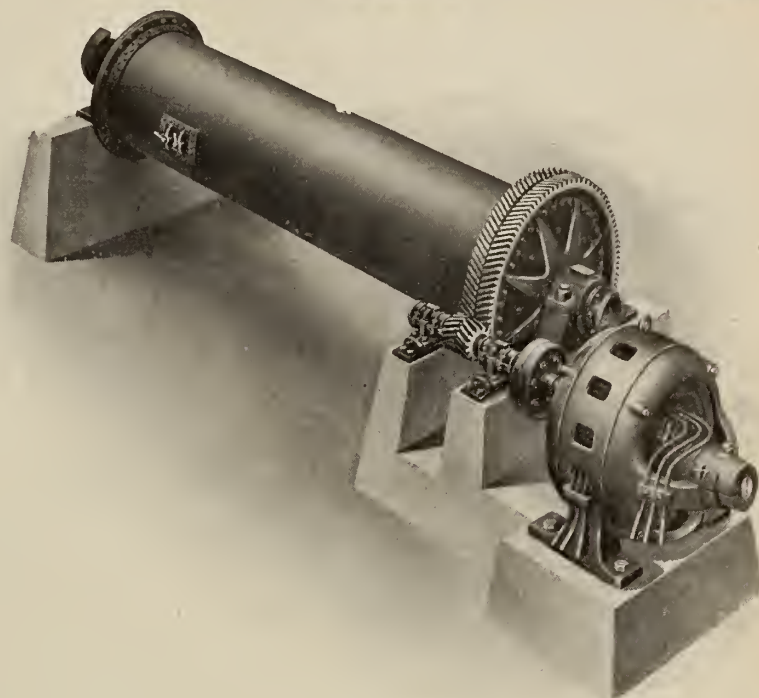
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Mussens, Ltd.  
Northern Canada Supply Co.
- Cement Machinery—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Jenckes Machine Co., Ltd.  
Northern Canada Supply Co.  
Peacock Bros.
- Chains—**  
Jeffrey Mfg. Co.  
Peacock Bros.  
Jones & Glassco  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co.  
B. Greening Wire Co., Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Chain Blocks—**  
The Herbert Morris Crane & Hoist Co., Ltd.
- Chemists—**  
Canadian Laboratories.  
Campbell & Deyell  
Thos. Heys & Son  
Milton Hersey Co.  
Ledoux & Co.
- Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.
- Coal Handling Machinery—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Coal Mining Explosives—**  
Curtis & Harvey (Can.), Ltd.
- Coal Mining Machinery—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Jeffrey Mfg. Co.
- Coal Punchers—**  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Washeries—**  
Jeffrey Mfg. Co.  
Mussens, Ltd.  
Peacock Bros.
- Compressors—Air—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Canadian Allis-Chalmers, Ltd.  
Laurie & Lamb  
Canadian Westinghouse  
Can. Ingersoll-Rand Co. Ltd.  
Cleveland Pneumatic Tool Co. of Canada, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.
- Concentrators and Jigs—**  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
James Ore Concentrator Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Fairbanks-Morse  
Jenckes Machine Co., Ltd.
- Concrete Mixers—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Condensers—**  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Laurie & Lamb  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.
- Converters—**  
Canadian Westinghouse  
Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Waterous Engine Works
- Conveying Machinery—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Cranes—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
M. Beatty & Sons, Ltd.  
Krupp, Fried. A. G., Germany
- Cranes—Electric—**  
The Herbert Morris Crane & Hoist Co., Ltd.
- Cranes—Overhead Traveling—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Crane Ropes—**  
Allan, Whyte & Co.  
Thos. & Wm. Smith  
B. Greening Wire Co., Ltd.  
G. Taylor Hardware Co., Ltd.
- Cranes—Swing Jib—**  
The Herbert Morris Crane & Hoist Co., Ltd.
- Cranes—Wall—**  
The Herbert Morris Crane & Hoist Co., Ltd.
- Crushers—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Peacock Bros.  
Lyman, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Haddfields Steel Foundry Co.
- Cyanide Plants—**  
Jenckes Machine Co., Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Roessler & Hasslacher  
Thos. & Wm. Smith  
Peacock Bros.
- Derricks—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.
- Diamonds (for Diamond Drills)—**  
Abe. Levine
- Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith & Travers.
- Dredging Machinery—**  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.
- Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers, Ltd.  
B. Greening Wire Co., Ltd.
- Drills, Air and Hammer—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Drills—Core—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.
- Drills—Diamond—**  
American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drill Steel Sharpeners—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Drills—Electric—**  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Siemens Co. of Canada, Ltd.  
Can. Ingersoll-Rand Co., Ltd.
- Dump Cars—**  
Sullivan Machinery Co.  
Waterous Engine Works Co.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Siemens Co. of Canada, Ltd.
- Conveyors—Belt—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.
- Dynamite—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives  
Northern Canada Supply Co.
- Dynamometers—**  
Can. Westinghouse Co.  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Siemens Co. of Canada, Ltd.
- Electric Cranes—**  
The Herbert Morris Crane & Hoist Co., Ltd.
- Elevating and Conveying Machinery—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Ejectors—**  
Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Elevators—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Krupp, Fried. A. G., Germany  
M. Beatty & Sons  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Waterous Engine Works.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Peacock Bros.
- Engineering Instruments—**  
C. L. Berger & Sons  
Peacock Bros.
- Engineers and Contractors—**  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Roberts & Schaefer Co.
- Engines—Automatic—**  
Smart-Turner Machine Co.  
Peacock Bros.  
Waterous Engine Works Co.  
The John Inglis Co., Ltd.
- Engines—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.  
Alex. Fleck  
Sullivan Machinery Co.  
Smart-Turner Machine Co.  
Peacock Bros.  
M. Beatty & Sons  
Canadian Westinghouse  
John Inglis & Co., Ltd.  
Can. Fairbanks-Morse Co.
- Engine—Haulage—**  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.
- Engines—Marine—**  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.
- Engines—Oil—**  
Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.
- Engines—Steam—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons  
Laurie & Lamb  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
The John Inglis Co., Ltd.
- Fans—Ventilating—**  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.
- Feeders—Ore—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.
- Filters—**  
Krupp, Fried. A. G., Germany
- Friction Hoists—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Forges—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.
- Forgings—**  
M. Beatty & Sons  
Canadian Cleveland Drill Co.  
Smart-Turner Machine Co.  
Peacock Bros.



# Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.  
Main Western Office - VICTORIA, B.C.

This stamp



means quality

Get this stamp on your explosives and you get efficiency.

See us before buying elsewhere.

We specialize in explosives for safe coal getting and rock work.

We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

We also handle the best of blasting accessories, including Electric Fuses, Electric Time Fuses, Safety Fuse, Blasting Batteries, Tamping Bags, Thawing Cans, Connecting Wire and Leading Wire, in fact everything needed for your work.

Our Stumping Powder has made land clearing cheap and easy for the farmer.

We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

## DISTRICT OFFICES:

NOVA SCOTIA:	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,	-	Kingston
MANITOBA:	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,	-	-	Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 32.)

- Furnaces—Assay—**  
Krupp, Fried. A. G., Germany  
Lymans, Ltd.  
Mussens, Ltd.
- Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada),  
Limited  
Canadian Westinghouse  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Gears—**  
Canadian Westinghouse  
Krupp, Fried. A. G., Germany  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.
- Generators—**  
Canadian Westinghouse  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.
- Hangers—Cable—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.
- Hand Hoists—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Heaters—Feed Water—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Laurie & Lamb  
Canadian Westinghouse  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
G. Taylor Hardware Co., Ltd.
- High Speed Steel Twist Drills—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Hoists—Air Electric and  
Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glasco  
Watrous Engine Works  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Siemens Co. of Canada, Ltd.
- Hoists, Chain, Electric and  
Pneumatic—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Moisting and Conveying Mach-  
inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.
- Hoisting Engines—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.  
Sullivan Machinery Co.  
Fraser & Chalmers, Ltd.  
Can. Ingersoll-Rand Co.
- Hoists—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Watrous Engine Works.
- Hose—**  
H. W. Johns-Manville Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Cleveland Drill Co.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Jacks—**  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Jigs—**  
Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.
- Lamps—Acetylene—**  
Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Northern Canada Supply Co.
- Lamps—Safety—**  
Canadian Explosives  
Peacock Bros.  
Ackroyd & Best  
Siemens Co. of Canada, Ltd.
- Link Belt—**  
Watrous Engine Works  
Northern Canada Supply Co.  
Jones & Glasco
- Locomotives—Electric—**  
Jeffrey Mfg. Co.  
Canadian Westinghouse  
Siemens Co. of Canada, Ltd.
- Locomotives—Steam—**  
Mussens, Ltd.  
Canadian Westinghouse
- Metal Merchants—**  
Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.
- Monel Metal—**  
Orford Copper Co.
- Motors—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
G. Taylor Hardware Co., Ltd.  
Canadian Westinghouse  
Peacock Bros.  
Siemens Co. of Canada, Ltd.
- Ore Sacks—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.
- Ore Testing Works—**  
Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell
- Ores and Metals—Buyers and  
Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Krupp, Fried. A. G., Germany  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pick Machines—**  
Sullivan Machinery Co.
- Picks—Steel—**  
Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Thos. & Wm. Smith  
Peacock Bros.
- Pipes—**  
Consolidated M. & S. Co.  
Peacock Bros.  
G. Taylor Hardware Co., Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.
- Pipe Fittings—**  
Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Canadian Westinghouse  
Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.
- Pneumatic Chain Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Pneumatic Tools—**  
Can. Cleveland Drill Co.  
Can. Ingersoll-Rand Co., Ltd.  
G. Taylor Hardware Co., Ltd.  
Jones & Glasco
- Producer—Gas—**  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.
- Prospecting Mills and Machin-  
ery—**  
Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.
- Pulleys, Shaftings and Hang-  
ings—**  
G. Taylor Hardware Co., Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.
- Pumps—Boiler Feed—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.
- Pumps—Centrifugal—**  
Fraser & Chalmers, Ltd.  
Rock & Power Mach'y, Ltd.  
G. Taylor Hardware Co., Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Thos. & Wm. Smith  
M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.  
Laurie & Lamb  
Fraser & Chalmers, Ltd.
- Pumps—Electric—**  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.
- Pumps—Pneumatic—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.
- Pumps—Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.
- Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
G. Taylor Hardware Co., Ltd.  
The John Inglis Co., Ltd.**
- Pumps—Turbine—**  
Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.
- Pumps—Vacuum—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Quarrying Machinery—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Krupp, Fried. A. G., Germany  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Rails—Mine—**  
H. A. Drury Co., Ltd.
- Roasting Plants—**  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany
- Rolling Mill Machinery—**  
Krupp, Fried. A. G., Germany
- Rolls—Crushing—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.  
Can. Allis-Chalmers, Ltd.
- Roofing—**  
Paterson Mfg. Co.  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville  
Geo. Taylor Hardware Co., Ltd.
- Rope Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Rope—Manilla and Jute—**  
Jones & Glasco  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.
- Rope—Wire—**  
B. Greening Wire Co.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith  
Fraser & Chalmers, Ltd.
- Rubber—**  
Canadian Consolidated Rub-  
ber Co., Ltd.  
G. Taylor Hardware Co., Ltd.
- Runways, Hand Operated—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Samplers—**  
Canadian Laboratories  
Ledoux & Co.  
Milton Hersey Co.  
Krupp, Fried. A. G., Germany  
Thos. Heys & Son
- Screens—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
R. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Watrous Engine Co.  
Fraser & Chalmers, Ltd.  
Jenckes Machine Co., Ltd.
- Separators—**  
Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Smart-Turner Machine Co.  
Peacock Bros.
- Separators—Magnetic—**  
Krupp, Fried. A. G., Germany
- Shear Legs—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Shovels—Steam—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
M. Beatty & Sons
- Slime Tables—**  
Deister Concentrator Co.  
James Ore Concentrator  
Can. Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany
- Smelting Machinery—**  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Peacock Bros.  
Fraser & Chalmers, Ltd.
- Stamp Mills—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.  
Fraser & Chalmers, Ltd.
- Steel Drills—**  
Rock & Power Mach'y, Ltd.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Krupp, Fried. A. G., Germany  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Swedish Steel & Imp. Co., Ltd.  
G. Taylor Hardware Co., Ltd.
- Steel—Tool—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Can. Fairbanks-Morse Co.  
Krupp, Fried. A. G., Germany  
N. S. Steel & Coal Co.  
Swedish Steel & Imp. Co., Ltd.
- Surveying Instruments—**  
Peacock Bros.  
W. F. Stanley  
C. L. Berger
- Switchboards—**  
Canadian Westinghouse  
Can. Allis-Chalmers, Ltd.  
Northern Electric Co., Ltd.  
Siemens Co. of Canada, Ltd.
- Tanks—Cyanide, Etc.—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
Jenckes Machine Co., Ltd.
- Tramways—**  
Mussens, Ltd.  
B. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.
- Transformers—**  
Canadian Westinghouse  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Peacock Bros.  
Siemens Co. of Canada, Ltd.
- Transits—**  
C. L. Berger & Sons  
Peacock Bros.
- Tractors—Oil—**  
Can. Fairbanks-Morse Co.
- Tube Mills—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.
- Turbines—**  
Rock & Power Mach'y, Ltd.  
Canadian Westinghouse  
Peacock Bros.  
Laurie & Lamb  
Can. Allis-Chalmers, Ltd.  
Siemens Co. of Canada, Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.
- Water Wheels—**  
Can. Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany
- Winding Engines—**  
Rock & Power Mach'y, Ltd.  
Watrous Engine Works  
Mussens, Ltd.  
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SHIELD AND HELMET FOR PROTECTING THE OPERATOR  
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They save worn and damaged steel and wrought iron parts of all kinds from the scrap heap, because with them a great number of welding, cutting, building up and repairing operations can be easily and economically carried out.

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*Two thousand square miles of railway lands in the Lake Superior region that have been held in reserve during the construction of the A. C. & H. B. Railway are now open for public prospecting.*

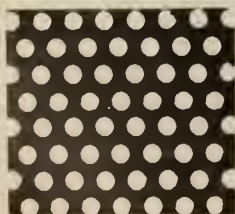
*No license is required; staking, recording and assessment work practically as on Government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. The lands are in alternate blocks with intervening areas of Government lands which are also open for prospecting. Two passenger trains daily through the district.*

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*For Every and All  
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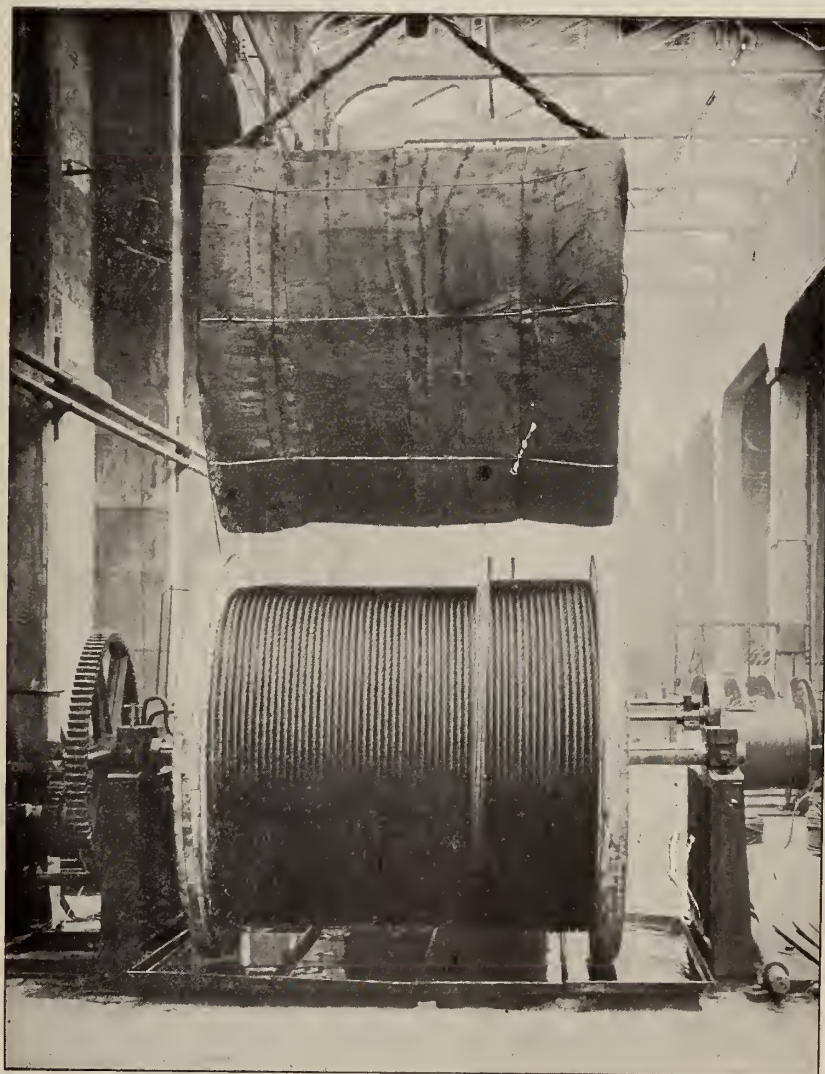
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For MINING:—

Winding, Hauling, etc.

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Two Reels of Wire Rope for a Colliery Company in Nova Scotia,  
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**MODERN AND UP-TO-DATE APPLIANCES**  
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# **CANADIAN MINING JOURNAL**

VOL. XXXV

TORONTO

No. 17

## **AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE**

Prevent your repair cost from mounting up  
by using

### **HOLMAN STEEL ROCK DRILLS**

Apart from the saving in maintenance, just consider the extra footage obtained by the Holman Steel Rock Drill which is always on the job.

Allow us to demonstrate the above facts.

We guarantee, that over long periods, the Holman Steel Rock Drill will drill greater footage at less cost for repairs and air than any other make of reciprocating rock drill on the market.

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Quarry Work with Holman Drills in British Columbia

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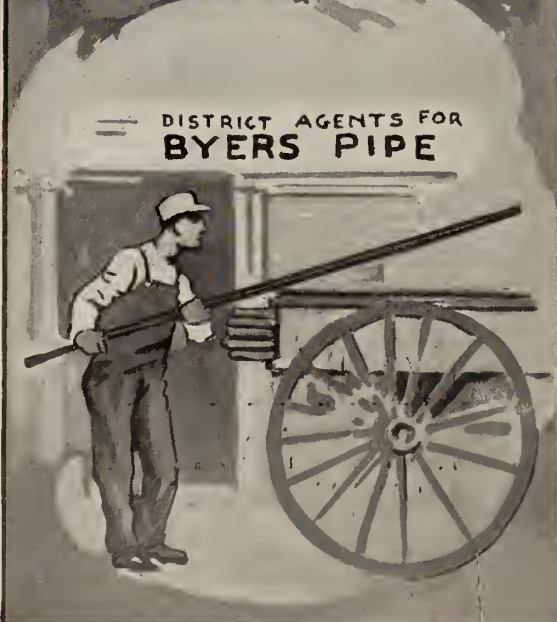
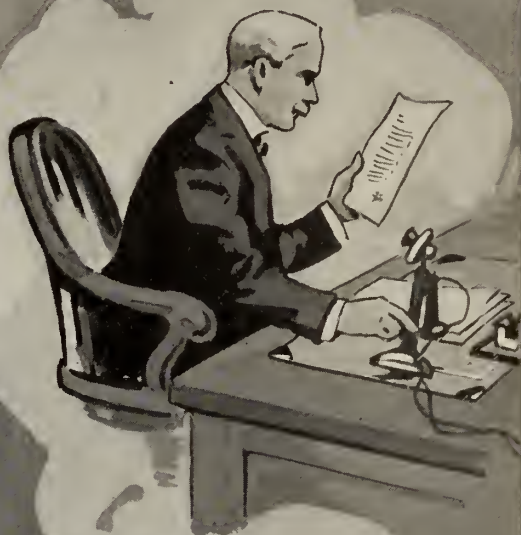
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DISTRICT AGENTS FOR  
**BYERS PIPE**

*—get in touch with the  
Byers District Agent in  
your particular territory*

There are many dealers, located at strategic shipping points throughout this country and Canada, who carry stocks of

## **BYERS** G E N U I N E **WROUGHT IRON** FULL WEIGHT GUARANTEED **P I P E**

These dealers can usually supply any ordinary pipe requirement in standard sizes and weights directly from stock. They can save you time and money when you need Byers for a rush job.

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For the large contract—in standard black or galvanized—or for the special specification, the Byers compact and independent organization assures swift shipment. Byers owns its mines, blast furnaces, ore steamers and rolling mills. It is subject to no outside influence likely to impair the efficient service it gives its customers.

*Write for the Byers book—"The Control of Quality in Every Process." It is full of valuable pipe information.*

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ESTABLISHED 1864  
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Every Rock and Ore Crushing Machine, supplied by us, is of the Kennedy design and Kennedy construction. We want the privilege of letting you see Kennedy's specifications so that you can compare them with all others.

Every refinement that it is possible to put into a machine, to make it stand up to the necessary arduous requirements, is to be found in Kennedy designs.

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Gyratory Crushers, up to 550,000 lbs. in weight.

Jaw Crushers up to 84 in. x 60 in. jaw openings.

Rolls up to 42 inches in diameter.

Kennedy Elevators with buckets 42 in. x 19 in. x 12 in.

Kennedy Revolving Screens up to 10 ft. in diameter and 60 ft. long.

Roll Hammer Crushers that will reduce hard 2 1/2 inch rock to sand in one operation at the rate of 70 tons per hour.

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made from special grades of Wire drawn to our specifications and carefully tested before being used. They are at work in all parts of Canada from Vancouver to Halifax and are everywhere recognised as the best on the market. Complete stocks held in all parts. Orders executed and quotations furnished by:--

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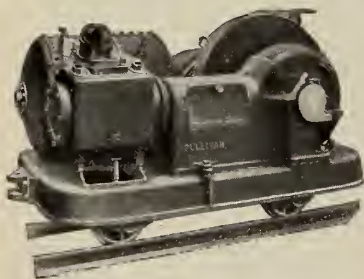
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possess advantages for underground power distribution that appeal to many mine owners.

It is easier and cheaper to string electric wires than to lay an air pipe, so that in extended workings, or in a mine under development, it may be more desirable to bring the air compressor to the drills than to set it up in the engine room "on top."

### Sullivan "WK-2" Compressors

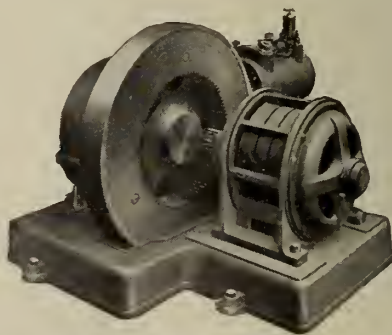
are complete, portable units, independent, except for the electric feed wire.

The single stage, center crank compressor is driven by motor, (A.C. or D.C.) through gear and pinion. The cylinder has a hopper jacket for cooling water. The motor is damp proof. Capacity, one or two rock drills or several hammer drills, etc.

A similar compressor "WK" is mounted on a sub-base for permanent, non-portable installation.

Bulletin 658-P.

Rock Drills, Hammer Drills, Hoists, Diamond Core Drills.



"WK" STATIONARY COMPRESSOR, WITH GEAR COVER REMOVED TO SHOW DRIVE

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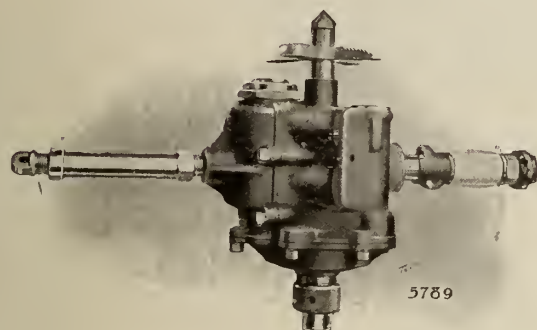
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They are Simple, Sturdy, Light and Convenient

"LITTLE DAVID" Drills embody improvements that mean real saving both in power and repair costs.

Power bills are reduced because energy is applied to the work in a most direct manner; valves are of the rotary type, quick opening, with sharp economical cut-off and smooth silent action; ports are short, direct and amply large; there is no unnecessary motions, no unnecessary parts; every part is carefully made to eliminate as far as possible the friction and vibration and to ensure smooth free running tools.

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*You will find "LITTLE DAVID" Drills the most Satisfactory  
Tools you have ever used.*

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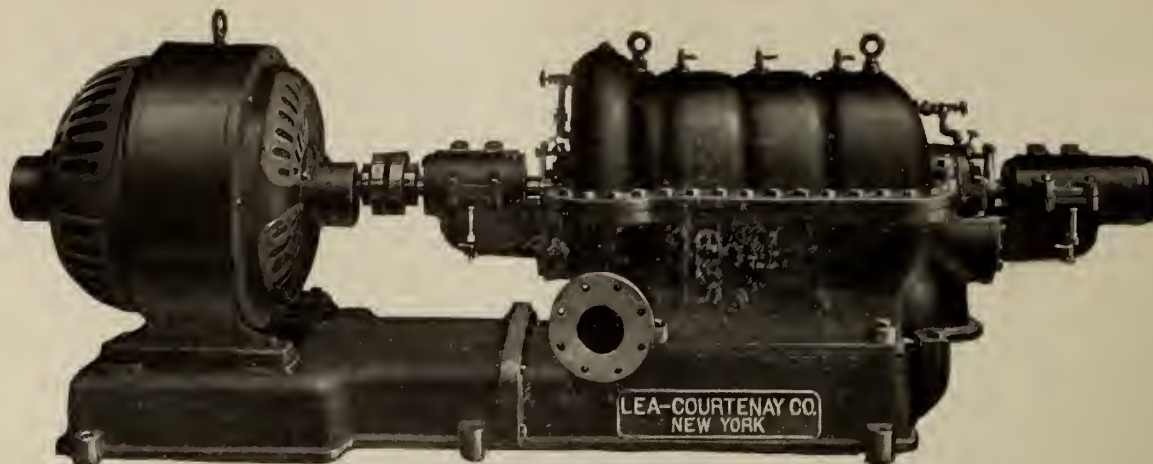
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Mine Drainage  
Fire Service

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SEND US PARTICULARS OF YOUR REQUIREMENTS

*Sole Canadian Agents*

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4 PHILLIPS PLACE

LIMITED

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## FORD MOTOR CARS

Save time and money by dispensing with your horse drawn vehicle and get a Ford Automobile. Bad roads don't "fizz" on the Ford---it is built to fit. New reduced 1915 prices now in force: 5 passenger Ford Touring Car, \$590.00; 2 passenger Runabout, \$540.00, F.O.B., Ford, Ont. We are agents for Temiskaming.

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Rubber Belting, plain and stitched 1½ in. to 12 in. wide.  
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All kinds of Rubber and Duck Packings.  
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NEW LISKEARD (Head Office)

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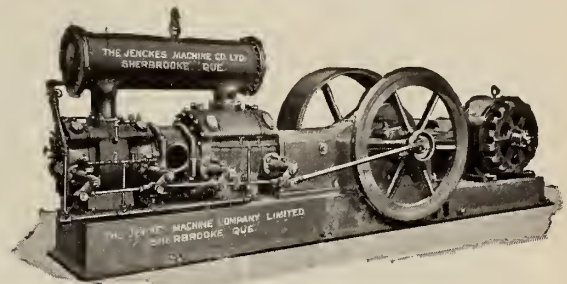
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## Synopsis of Coal Mining Regulations



**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B.—Unauthorized publication of this advertisement will not be paid for.—58782.

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We will be pleased to have your specifications  
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"IT WILL PAY YOU TO GET OUR PRICES."

Our Large Stock Guarantees You the Most Prompt  
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### Milling and Mining Machinery

Shafting, Pulleys, Gearing, Hangers,  
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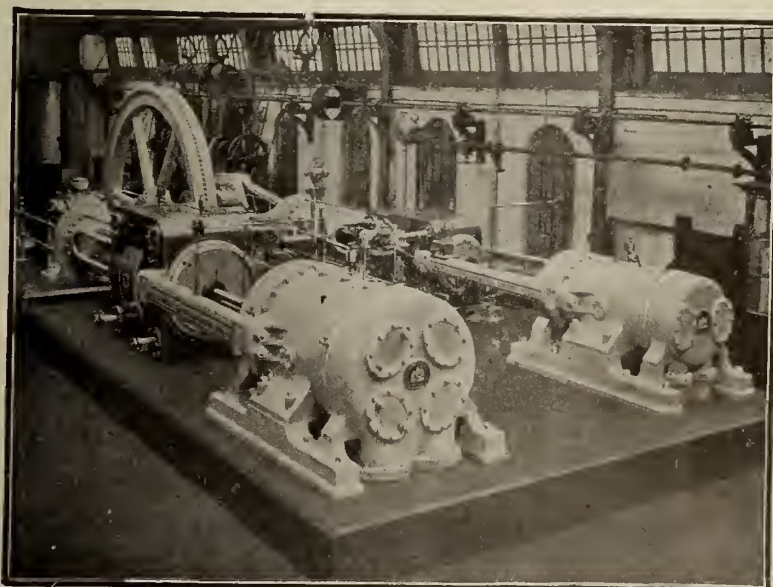
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Very low prices.

Address

**Acadia Coal Company, Limited,**  
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**Blocks**

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## METALLIC NICKEL

Prime Metal for the manufacture of Nickel Steel, German Silver, Anodes and all Alloy purposes.

**The International Nickel Co.**

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**Electrolytic**

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(99.80% Pure)



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A special demonstration in every mine is out of the question—but why not let us send you one for trial

### IN YOUR OWN MINE

so you can find out for yourself what it will do.

Write for Bulletin 40A

**Cleveland Pneumatic Tool Co.**  
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Successors to  
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We have specialized in Steel Tank building. A separate department of our boiler shop does this class of work only. Up-to-date equipment, honest materials and 30 years' experience are combined in the product that leaves this shop.

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PRESSURE TANKS, STORAGE TANKS,  
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*In any size, any style, any number*

You get the benefit of the pioneering we have done to cut down Tank-building costs in the exceptionally attractive prices we can now quote you on Waterous Tank work.

Remember, we build Steel Plate work of all kinds—turned out right, at a reasonable price.

We will be glad to figure on your sketches.

**The Waterous Engine Works Co., Ltd.**

51

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Our Mining Ropes are especially constructed to suit the requirements for HOISTING or HAULING.

**Crucible Cast Steel**  
**Best Plow Steel**  
**Acme Brand,**  
 extra high breaking strain for deep shafts.  
**Regular Lay      Lang's Lay**  
**Wire Rope Fittings**  
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ASK FOR OUR NEW ROPE CATALOGUE

The

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Limited

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**Manufacturers of Hammered and Rolled Steel for Mining Purposes**

Pit Rails, T Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel 3 8" to 14" Diameter, Steel Tub. Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting 5 8" to 5" true to 2/1000 part of one inch. A full stock of Mild Flat, Rivet Round and Angle Steels always on hand.

SPECIAL ATTENTION PAID TO MINERS' REQUIREMENTS. CORRESPONDENCE SOLICITED.

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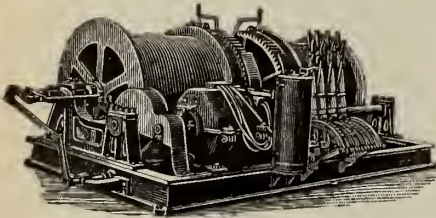
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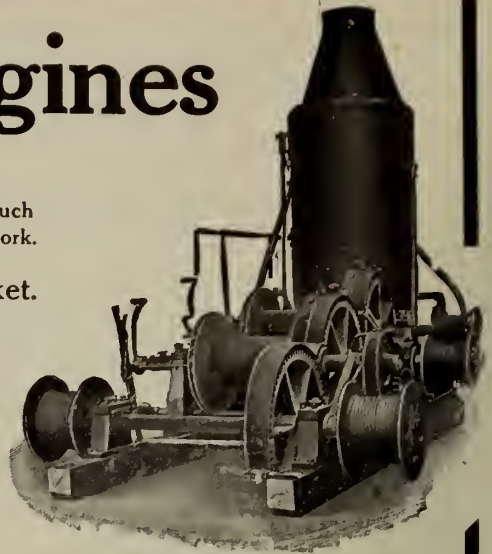
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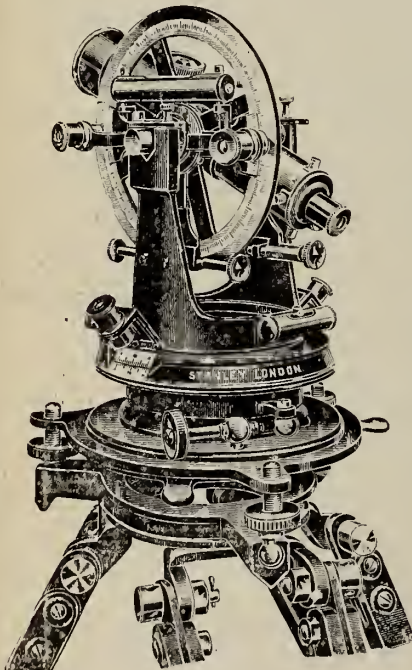
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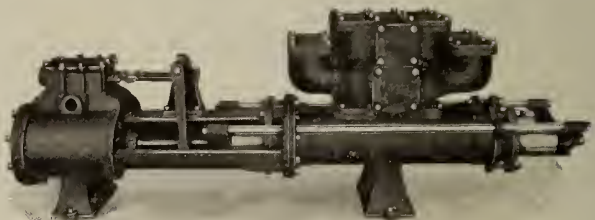
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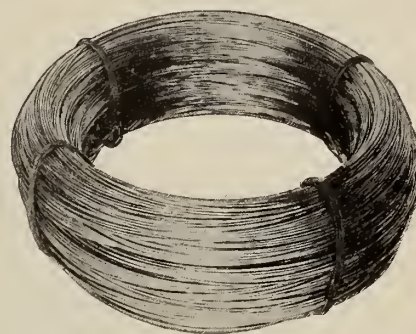
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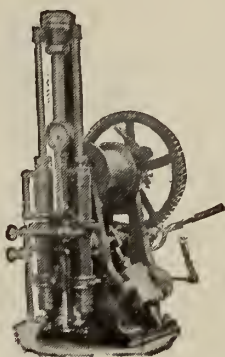
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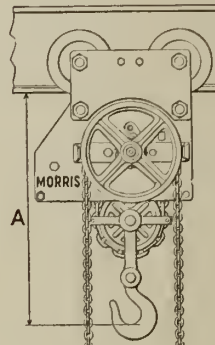
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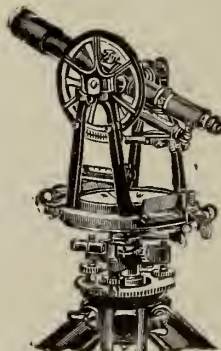
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## —CONTENTS—

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Deposition of Minerals.	Deposits Formed by Concentration of Substances Contained in the Surrounding Rocks by Means of Circulating Waters.
The Flow of Underground Waters.	Deposits Formed by Regional Metamorphism Formed by Zeditisation.
The Composition of Underground Waters.	Deposits of Native Copper in Basic Lavas.
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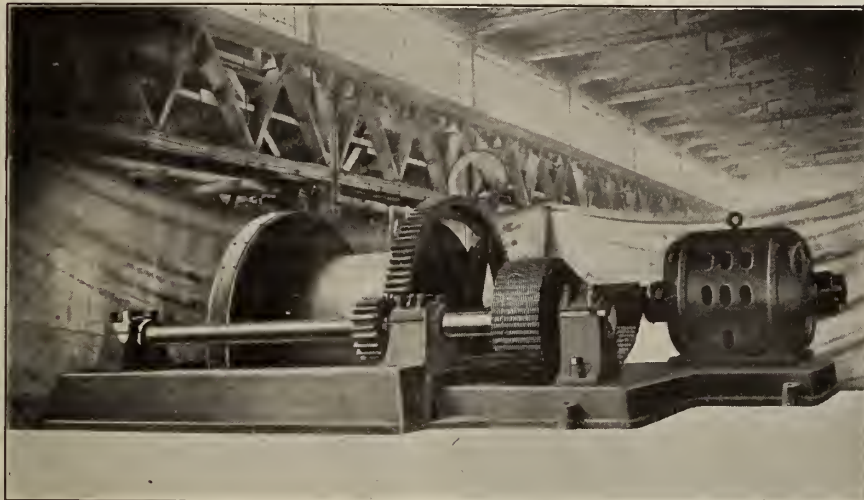
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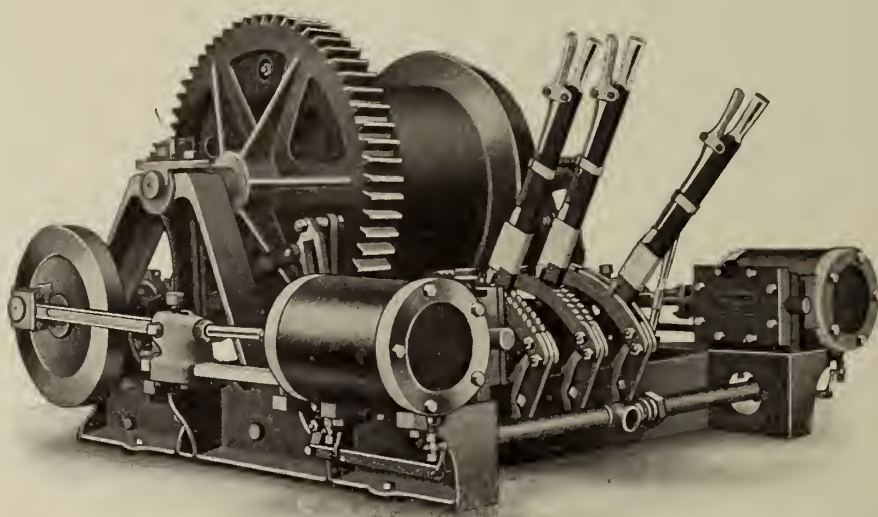
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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, September 1, 1914.

No. 17

## The Canadian Mining Journal

With which is incorporated the  
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Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

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Editor

REGINALD E. HORE

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#### CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd, 1879."

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## MINING MEN AND THE WAR

The war in Europe is bringing the sons of the Empire together. From all corners of the earth offers of assistance are showering on the Mother Country. Australasia, India, South Africa and Canada are sending men to assist in the fight for freedom. The struggle has just begun. Men and money, millions of men and hundreds of millions of dollars, will be needed to overcome the German hosts.

That a very large number of Canadians will enlist to fight wherever and whenever the War Office wants them is certain. It has been suggested that mining engineers would be of very considerable service to the Empire and that their special qualifications could be used to greater advantage by the formation of an engineering corps. Already many mining men have enlisted in the regular corps and others have offered their services.

In London the Institute of Mining and Metallurgy through President Dr. F. H. Hatch and Secretary Chas. McDermid have made a proposal that the members of the institution should form a volunteer corps to be placed at the disposal of the War Office for special home service. The War Office has not yet availed itself of the offer; but will doubtless do so if the necessity arises.

On behalf of the committee of the Mining and Metallurgical Club, Mr. Edgar Rickard, the president, has sent a letter to the Lady Mayoress, at the City of London branch of the British Red Cross Society, offering the premises of the club in response to her request for the loan of suitable halls and buildings within the city which may be utilized in case of necessity as temporary hospitals. The club's premises at No. 3, Londonwall buildings are extensive—they cover an area of about 6,000 square feet—and they include a complete kitchen outfit capable of cooking a couple of hundred meals a day.

Mining men in England are giving their services to their country in many ways, in addition to taking their places in the army. Canadians will not be slow to respond to an urgent call.

Lord Kitchener is reported to believe that the Empire has entered a struggle for life or death. We have every confidence in the War Secretary and in the Navy and Army, and believe that the result will be life for British liberty and death for German tyranny. The cost in lives and gold will be enormous; but the situation calls for destruction of the enemy at any price. Prompt response to Kitchener's calls will help keep down the cost. He is a good manager, the best in the world to-day.

## THE SILVER INDUSTRY

The producers of silver have experienced considerable difficulty in disposing of the metal during the past few weeks. For some days the outlook was very discouraging; but the situation is now much better. London is taking silver at a higher price than before the war and shipments have been resumed. It is understood that the English mint is buying large quantities and it is expected also that the United States Government will buy several million ounces.

The market is, however, a limited one and buyers are afraid to commit themselves. The Cobalt district mines have suffered in consequence. Some have been closed down. Some are being operated with reduced forces. Some are producing as before.

The uncertainty has made it difficult for the producers and buyers to agree on prices. Consequently the companies find it advisable to await developments. Most of them will continue to produce silver, while a few have ceased operations.

In some cases shutting down is necessary. In other cases it is a doubtful expedient. Companies having a good cash surplus owe it to their employees and to the country to continue operations if it can be done at no great loss. To throw men out of work at this time is particularly regrettable.

It is quite conceivable that a company might eventually make a few dollars more for its shareholders by stopping operations until the market improves. It is to be hoped, however, that an endeavor will be made to keep the mines open even at the risk of slight losses. If over-production is feared more attention might be devoted to exploration and development. There is unfortunately an overly abundant supply of labor just now. Some companies are in a position to use it to advantage.

The application of the Temiskaming mine managers to the Dominion Government for aid in marketing silver has been promptly answered by an announcement that the banks are now ready to advance 30 cents an ounce on silver bullion deposited with them. This will enable the producers to keep their employees at work during the period of uncertainty.

## DEPUTY MINISTER OF MINES RESIGNS

According to an Ottawa despatch Mr. R. W. Brock, Deputy Minister of Mines, has resigned to accept a position as head of the Department of Mines in the University of British Columbia.

Mr. Brock is well known in the western Province where he worked when employed as a field geologist by the Geological Survey. His experience at Ottawa as Director of the Geological Survey and during the last year as Deputy Minister of Mines makes him unusually well qualified as an executive head. His earlier experience as Professor in Geology at the School of Mining, Kingston, and as a geologist on the staff of the Geological Survey will also stand him in good stead. His work in the mining districts of British Columbia has made

him especially familiar with the conditions there. The new university is fortunate indeed in securing the services of Mr. Brock.

## GOLD MINING

The war has called attention to the fact that gold mining has some very distinct advantages over the mining of other metals. At ordinary times the fixed price and constant demand for gold have enabled mining men to make more definite valuation of gold deposits than of other orebodies. Instead of figuring in ounces it is possible to figure in dollars. Knowing costs of mining and treating the ore and the amount of ore the value may be determined. For other metals an additional variable, price, must be constantly kept in mind. Gold mining is an especially sound industry in times like the present. The market for many other metals produced in America is poor, but gold is in great demand.

A rather unfortunate circumstance is the fact that we do not in Canada produce all the necessary materials for the treatment of gold ores. Cyanide ordinarily is obtained from Germany. One producer in Great Britain is said to be able to supply large quantities, but this will doubtless find its way to the Rand. The establishment of a manufacturing plant here or in the United States is greatly to be desired.

With a good supply of chemicals on hand the gold mines may be expected to break records this winter. Some companies, however, are likely to be embarrassed if new supplies are not soon available.

## TRADING IN MINING STOCKS

With the announcement that war had been declared by Austria on Servia, holders of mining stocks, like holders of most other stocks, suffered severe losses. Prices dropped quickly, and a general panic threatened. Very prompt action on the part of the directors of the Canadian exchanges checked the selling.

On July 28th the Toronto Standard Stock and Mining Exchange was closed. There was therefore considerable interest shown when on Monday, August 24th, the exchange was opened for cash trading. The experiment is considered as being fairly successful. Holders who are pressed for money have an opportunity of selling. Investment hunters are given an opportunity. Protection against bear raiding has been provided for by fixing for each stock a minimum price, below which no sales are permitted.

The small offerings indicate that holders are of the opinion that Porcupine and Cobalt stocks will not suffer as badly as many industrial stocks during the war.

Transactions in New York indicate that the war is expected to interfere with copper mining for some time. A very large percentage of the copper produced in America is exported and ordinarily the greater part of it is consumed in Germany. This market being lost the value of copper stocks has appreciably decreased. The trading reflects the condition.



## MUSEUM BULLETIN.

The second of a series of publications by the Museum of the Geological Survey has been issued. This contains papers on petrology, physical geography, anthropology, geology and paleontology. Mr. S. J. Schofield discusses the origin of the granite in the Purcell sills. Mr. E. M. Kindle writes on "Columnar Structure in Limestone"; Mr. J. W. Goldthwait on "Supposed Evidences of Subsidence of the Coast of New Brunswick Within Modern Time"; Mr. Paul Radin, on the Ojibwa; Mr. S. J. Schofield, on Pre-Cambrian Rocks of British Columbia; Mr. L. D. Burling, on Early Cambrian Fauna, and Mr. A. E. Wilson, on Parastrophia Hemiplicata.

## CLAY AND SHALE DEPOSITS OF THE WESTERN PROVINCES.

The Geological Survey has published a memoir, No. 47, by Heinrich Ries on Western clays. Mr. Ries concludes from his examination that several formations carry a variety of clay resources, which it will pay to develop. The clays of several regions are described and their uses stated. Copies of the publication may be obtained on application to the director of the Geological Survey.

## KIRKLAND LAKE AND SWASTIKA.

The Ontario Bureau of Mines has published a report on the Kirkland Lake and Swastika Gold Areas, by A. G. Burrows and P. E. Hopkins. The report is based on field work done in the past three years and contains much useful information concerning the gold deposits and the general geology of the district. It is well illustrated and accompanied by detailed geological maps.

During part of 1911 Mr. E. L. Bruce examined an area in the vicinity of Swastika in which are situated the Swastika and Lucky Cross mines. In 1912 and 1913 further geological work was done, special attention being given in 1913 to the region around Kirkland lake, where numerous gold-bearing quartz veins had been discovered. A great part of the area around Swastika and eastward to Larder lake was staked during the rush into Larder lake in 1906, during the boom days of Cobalt. Most of these claims were, however, abandoned before much work had been done.

Gold was first found in a vein on the north shore of Otto lake on a claim which is now part of the Swastika mine group. In 1911 the metal was discovered in several veins to the north of the railroad and just east of Amikoungami creek. These discoveries were later developed by the Lucky Cross Mining Company. Beyond these two properties there has been little development in the Swastika area apart from prospecting on a number of claims. The claims which were staked in the Larder lake rush and abandoned have been restaked, and important gold discoveries made. The first discovery in the Kirkland lake area was on the Wright-Hargrave claim to the east of the lake. Gold was found in the quartz veinlets which traverse the reddish feldspar-porphry. In January, 1912, gold-bearing veins were found in the porphyry and the conglomerate on the Tough-Oakes claims, three-quarters of a mile northeast of Kirkland lake. However, very little interest was taken in the Kirkland lake area in 1912, but the development of No. 2 vein of the Tough-Oakes group and the shipment of high-grade gold ore from this property caused great interest in the area in 1913, and much surface trenching was done. At the Tough-Oakes two shafts have been sunk.

## THE BELGIANS

*"Horum omnium fortissimi sunt Belgae."*—Caesar's Gallic War, Book I.

"The bravest of these are the Belgians,"  
So Julius Caesar said;  
The bravest of all are the Belgians,  
Again is written in red.

Hearts Gallic and gallant, unchanging  
Through centuries between,—  
No more than in days of the legions  
Do they fear a war machine.

'Twas forests and fens and marshes,  
'Tis gardens, factories, now,  
But never a change in the spirit  
Disdaining to cringe or bow;

'Twas swords, spears, skins and bucklers,  
'Tis shell and machine guns here;  
Both odds on the proud invader,—  
Yet never a shrink of fear.

Shrewd Caesar adjudged they were valiant  
Since far from the softening things  
Of luxury, peace and comfort  
The smooth-voiced trader brings;

Now long have they been purveyors,  
Bland, busy, adroit and gay,  
Of things to adorn or amuse us,—  
But theirs the same soul to-day.

And theirs the same soil, war-ravaged,  
Now drenched with a deeper dew  
Than e'er in Brabant's old squabbles,  
Than crimsoned at Waterloo,

The soil that they die to keep sacred,  
And now with their blood retrace  
The ink of a broken treaty,—  
What glory, and what disgrace!

Aye, vote to pin ribbon of honor  
On Liege's battered wall,—  
Learns Kaiser, as Caesar, that these are,  
Though beaten, the bravest of all!

—Boston News Bureau.

## INDUSTRIAL HYSTERIA

Canadians are showing symptoms of an acute attack of economic neurosthenia. No one can accuse us of being afraid to fight. Show us a German and we will tackle him, without hesitation. What we are afraid to do is to go on living. Instead of composedly and cheerfully taking up each day's task as the day appears, we are trembling in anticipation of unimaginable scarcity and poverty. It is not hard times that we expect, we have them already. It is not simply hard times made harder by war. We could understand that and meet it. It is times so stark and inflexible that iron is in comparison as a sponge and the traditional poker pliant as a thread. More prosaically, it is something formless, vast and ghostly, the more dreadful because our reason gives it no shape. If we were all to be doomed to death by slow starvation we should scarcely be more frightened.

We may admit that the war will disturb trade, remove bread winners from their homes, pile up private and public debts, and generally mitigate the prosperity of the recent past. It is well to be prudent, to eschew



luxury, to avoid overproduction, and to provide means for helping the specially unfortunate. Having said this we have said it all. The sun will shine, the harvests will ripen, all the staple commodities will have to be produced, and there will be just as much food and money in Canada next February as there was last February.

Fear is one of the greatest forces which operates in the human breast. In its two forms of worry and of terror it shapes much of the course of human conduct. Its chosen agent is the imagination. Its chief activity is crossing bridges before one comes to them.

If anything will precipitate financial disaster it is this mood of dread. President Wilson has vigorously pointed this truth out to our neighbors in the south. Our economic ills, like some of our physical ailments, are born and incubated in our thinking. When householders get panic-stricken and buy flour by the half dozen barrels instead of by the bag the price of flour must go up. The demand exceeds the supply and prices must rise. What seems to be a vindication of the forethought is only a consequence of the folly. When merchants, manufacturers, loan companies and banks run for shelter their flight transforms the wind into a whirlwind. When everybody predicts economic woe a false prudence is developed which defeats itself. People seek to save money and get no money to save.

Moreover, the shyster patriot finds his excuse for grinding the faces of the poor. The coal merchant, with his bunkers filled at last year's buying price, hangs a flag out of his upstairs window and adds a dollar to the selling price of each ton. Bread, meat, sugar, potatoes—the traffic in none of which has been affected—are racing up the scale. It is to defeat such scurrilous avarice, itself terrified yet preying on the terror of others, that the British Government has taken over the flour mills of Britain.

Let it be repeated that this is a time for economy. It is also a time for heroic effort to keep the business of the country going. It is a time to shorten sail, or run the screw at half speed. It is not a time to put on a life preserver and take to the rafts. If the industry and commerce of Canada are paralysed this winter it will be because the people of Canada grew hysterical with fear of the unknown and unlikely.

Consider: the dearth is more likely to follow the war than to accompany it. And then it can be more advantageously met, when the stress and frenzy of the fighting is past. War makes work in many ways. Enormous sums of money are distributed to the producers of many articles. Farmers, manufacturers of boots and clothing, coal miners and all the middle men who handle these things will be uncommonly busy. The taking of so many men out of their jobs opens doors to the unemployed. It is when the war is closed and the disbanded troops come home that the trouble is to be expected. The great panic of the Napoleonic period was in 1813, when his power had been broken by the disastrous campaign in Russia. Let us be cheerful yet awile.

King David decreed that those who stayed by the stuff should share in the spoil with those who went out to battle. He recognized that there was parity of merit, even though there was diversity. It is as hard to wait and endure as it is to fling one's self into the enemy's trench. We send our contingent across the sea with perfect confidence in its courage. Our brave boys will not disgrace the families they have left behind. They will find the courage they need.

Are we who remain behind finding the courage we need? Perhaps it is a little harder to find. We are not beckoned on by glory, nor keyed to exaltation. There is no pomp nor circumstance in the inglorious drudgery

of keeping the national shop open. But that is the patriotic task of the stay-at-homes. Many a man would be ashamed if his son, rifle in hand, failed to stand up against a charge of the foe, yet at the first indication of financial danger he himself deserts the employees who depend on him for work and wages, and runs to save his dollars. Strange that it is so easy to risk one's life, so hard to risk one's money.

Let us call things by their true names. It is nothing else than chicken-heartedness which ails many Canadians, more or less prominent in the world of business. They are cowards and they are in danger of bringing us all, themselves included, to needless penury and financial disaster. They are turning back in the day of battle.—*Journal of Commerce.*

## A WORD IN SEASON

For the first time since the Crimean struggle of 60 years ago Great Britain is committed to a great European war. But this time it is war on a scale so colossal that history can find no precedent for it. That the disaster is one of the first magnitude, so searching, indeed, that it affects the fortunes of every man, woman and child in the kingdom, is, of course, apparent. But there is another and a very different side to the medal. Nothing is more certain, now that the ambitions, not so much of the nation as of the ruling clique in Germany, have been laid bare to the world, than that a war waged by that State preferably with France first and England afterwards was bound to come—was, indeed, inevitable. How often have we heard of the possibility of a sudden raid by Germany on this country? Of England being taken unready and at a disadvantage? But how different is the present situation? Austria to all appearance is so fully occupied with Servia and Russia that she will be able to render comparatively little effective assistance to Germany. Italy and Turkey have declared their neutrality, which, for the present at least, they are likely to maintain. On the other side we have France, Russia, Great Britain, Belgium, and possibly Holland, whose territory has been violated, arrayed against Germany. Numerically, these forces are greatly superior, and although Germany has the advantage of concentration, it is probable that she will exhaust herself in her conflict with France and Belgium and will be less able to resist the slow but enormous pressure which Russia can bring to bear.

At sea the preponderance of power is still more in favor of the Triple Entente. The British fleet in number, ships, armament, tradition and personnel is greatly superior to the Teutonic navy, and will be shortly increased. It will also have the benefit of some assistance from France and Russia. If, as we believe, a conflict with Germany was inevitable, it could hardly have come at a better time for us than the present, when we are prepared, are not taken by surprise, and have the active assistance of so large and powerful a section of Europe. Not only honor, therefore, which is a great national asset, as involved to-day in the vindication of solemn treaties, but also intelligent self-interest forces us to reject the ignominious position of a bribed spectator to vindicate our worth as an ally and to show that ours is not merely a fair weather friendship. No one can count confidently on the chances of war. Germany alone is a force which no combination of Powers can afford to despise, but, humanly speaking, the prospects are strongly in favor of the Allies. If we cannot beat Germany on the seas under such conditions we may as well resign ourselves to a position as a second rate Power. But we can trust our navy.—*Financial Times, London.*



## THE ISSUE

### SIR EDWARD GREY'S STATEMENT TO THE HOUSE

In the House of Commons, on Monday, Aug. 3, Sir Edward Grey, who was received with loud and prolonged cheers, said:

Last week I stated that we were working for peace, not only for this country, but to preserve the peace of Europe. (Cheers.) To-day, though events have moved so rapidly that it seems difficult to state with technical accuracy the state of affairs, it is clear that the peace of Europe cannot be preserved. Russia and Germany have declared war upon each other. Before I proceed to state the position of His Majesty's Government I would like to clear the ground, so that the House may realize, before I come to state to the House what our attitude is with regard to the present crisis. First let me say very shortly we have consistently worked with a single mind, and with all the earnestness in our power to preserve peace. The House may be satisfied on that point. We have always done it, and in these last years, so far as His Majesty's Government is concerned, we should have no difficulty in proving it. Through the Balkan crisis we worked for peace. (Cheers.) With the co-operation of the Great Powers, we were successful in working for peace in the Balkan peninsula. It is true that some of the Great Powers had difficulty in adjusting their points of view, and much time and labor was expended before they could settle their difficulties. But peace was secured, because peace was their main object, and we willingly gave time and trouble to render a settlement of their differences possible. In the present crisis that has not been possible, because there has been little time, and because there has been a disposition in some quarters, upon which I will not dwell, to force things rapidly to an issue, to the great risk of peace. As we now know, the result of that is that the policy of peace, so far as the Great Powers are concerned, has failed.

#### Efforts For Peace.

I do not want to dwell on that, or say where the blame seems to lie, or which Powers were most in favor of peace, and which were most disposed to risk their interests and endanger peace. I want to approach this crisis from the point of view of British interest, British honor—(overwhelming cheers)—and British obligation—(renewed cheers)—free from all questions as to why peace has not been preserved. We shall publish papers as soon as we can with regard to what took place last week when we were working for peace, and when these papers are published I have no doubt that to every human being they will make it clear how strenuous and genuine and whole-hearted all our efforts for peace were. Well, I come first to the question of our treaty obligations. I have assured the House, and the Prime Minister has assured the House more than once, that if any crisis such as this arose we should come before the House of Commons and be able to say to the House that it was free to decide what the British attitude should be; that we would have no secret engagement—(hear, hear)—which we should spring upon the House. I will deal with this point first.

#### The Alliance and the Entente.

There have been in Europe two diplomatic groups, the Triple Alliance and what has come to be called the Triple Entente. The Triple Entente was not an alli-

ance; it was a diplomatic group. The House will remember that in 1908 there was a crisis, also a Balkan crisis, arising on the annexation of Bosnia and Herzegovina. The Russian Minister came to London and I told him definitely then, this being a Balkan crisis, I did not consider that the public opinion in this country would justify us in promising anything more than diplomatic support. More has never been asked from us, more was never given, more was never promised. Well, in this present crisis, up till yesterday, we had also given no promise of anything more than diplomatic support. Well, now, to make clear this question of obligation to the House, I must go back first to the Moroccan crisis of 1906. That was the time of the Algeiras Conference. That was a difficult time for the Government, because a General Election was in progress. Ministers were scattered over the country, and I spent three days a week in my constituency and three days in the Foreign Office. I was asked the question whether, if that crisis developed into a war between France and Germany, we would give armed support. I said then that I could promise nothing unless I was sure of the whole-hearted support of public opinion here when the occasion arose. I said that, in my opinion, if war was forced upon France upon the question of Morocco, a question which had just been the subject of agreement, that if out of that agreement war was forced upon France at that time, in my opinion the public opinion of the country would rally to the support of France. (Cheers.)

#### No Promise.

But I made no promise. I expressed that opinion in the same words to the French and German Ambassadors at the time, without making any promise. That position was accepted by the French Government, but they said at the time to me, and very reasonably, "If you think it possible that public opinion in Great Britain might, when a sudden crisis arose justify you in giving to France armed support which you cannot promise in advance, unless between military and naval experts some conversations had taken place, you would not be able to give that support even if you wished when the time comes." There was force in that contention, and I agreed to it, and authorized those conversations to take place, but on the distinct understanding that nothing which passed between the naval and military experts of either Government in any way restricted our freedom as to whether or not we should give that support when the time arrived. On that occasion a general election was in progress, and I had to take the responsibility of what I did, because the Cabinet could not be summoned. Those conversations took place between the naval and military experts.

#### Letter to French Ambassador.

Some time afterwards, in 1912, the matter was discussed with the Cabinet, and it was decided that we ought to have a definite understanding in writing. It was only to be in the form of an unofficial letter that the conversations were not binding upon the freedom of the Governments. On 22nd November, 1912, I wrote a letter I will read to the House to the French Ambassador, and I received from him a letter in similar terms in reply. This letter will be known to the pub-



lie now as the record of what took place between the military and naval experts, and not binding engagements upon the Governments:

"My dear Ambassador:

"From time to time in recent years the French and British naval and military experts have consulted together. It has always been understood that such consultation does not restrict the freedom of either Government to decide at any future time whether or not to assist the other by armed force. We have agreed that the consultation between the experts is not, and ought not to be, regarded as an engagement that compels either Government to action in a contingency that has not yet arisen and may never arise. The disposition, for instance, of the French and British fleets respectively at the present moment is not based upon an engagement to co-operate in war. You have, however, pointed out that if either Government has grave reason to expect an unprovoked attack by a third Power it might become essential to know whether it could in that event depend upon the armed assistance of the other. I agree that if either Government had grave reason to expect an unprovoked attack by a third Power or something that threatened the general peace, it should immediately discuss with the other whether both Governments should act together to prevent aggression and to preserve peace, and if so what measures they would be prepared to take in common."

#### Commons Free to Decide.

Lord Charles Beresford: What date was that?

Sir Edward Grey: 22nd November, 1912. That is the starting point of the Government with regard to the present crisis. I think it makes it perfectly clear that what the Prime Minister and I have said in the House of Commons was justified, and that as regards our freedom to decide in a crisis what our line should be, the Government remain perfectly free and *a fortiori* the House of Commons remain perfectly free. That I say to clear the ground from the point of view of obligation, and I think it was due to prove our good faith to the House of Commons that I should give that full information to the House now, and say that we do not construe any thing which has previously taken place in our diplomatic relations with other Powers in this matter as restricting the freedom of the Government to decide what attitude they shall take now or the House of Commons to decide what their attitude should be. The situation in the present crisis is not precisely the same as it was in the Morocco question. Then it was primarily a dispute which concerned France, and we were obliged to side with France diplomatically in that question. The present crisis has originated in a dispute between Austria and Serbia. I can say this with the most absolute confidence, that no Government and no country has less desired to be involved in war over the dispute between Austria and Serbia than the Government and country of France. (Loud cheers.) France is involved in it because of her obligation of honor owing to her alliance with Russia. Well, sir, it is only fair to tell the House that that obligation of honor cannot apply in the same way to us. (Labor cheers.) We were not parties to the Franco-Russian Alliance—we do not even know the terms of that alliance.

#### Clearing the Ground.

That, I think, has cleared the ground, so far as the obligation of honor. What, then, is our position? We have had for many a year a long standing friendship

with France. (Cheers.) I remember well the feeling in this House, I remember my own feeling, when the late Government made that agreement with France—the warm cordial feeling resulting from the fact that these two nations which had perpetual differences in the past had cleared those differences away. (Cheers.) How far that friendship entails obligation it is for every individual member of this House to consider for himself. On this point the House must separately and collectively judge for itself. The French nation has a fleet which is now in the Mediterranean. The north and west coasts of France are absolutely undefended. With the French fleet in the Mediterranean the situation is very different from what it used to be so far as France is concerned. The friendship that has grown up between the two countries had given them a sense of security that there was nothing to be feared from us. My own feeling is this, that if a foreign fleet engaged in war which France had sought came down the English Channel and bombarded and battered the undefended coast of France we could not stand by. (Loud and prolonged general cheering.) With this thing going on under our very eyes we could not stand by with our arms folded looking on dispassionately doing nothing. That, I believe, is the feeling of the country. (Loud general cheers.) But I want to look at it from the point of view of British interests, and it is from that point of view that I am going to base and justify what I am presently going to say to the House.

#### Britain's Interests.

If we are to say nothing at this moment, what is France to do with her fleet in the Mediterranean, with her northern and western coasts absolutely undefended at the mercy of the German fleet coming down the Channel to batter her northern coast? We must remember that we are faced with a war of life and death. It may be that the French fleet will be withdrawn from the Mediterranean. We are in the presence of a European conflagration. Can anyone set limits to the consequences that may arise from it? Let us assume that we stand aside in an attitude of neutrality. Let us suppose that the French fleet is withdrawn from the Mediterranean. Let us assume that events may arise which would make it necessary in defence of vital British interests that we must go to war. Let us assume that Italy will not remain neutral, as she is at present because she understands that this war is an aggressive war—(loud and prolonged cheers)—and that the Triple Alliance is a defensive alliance. Let us assume that Italy must depart from her attitude of neutrality at a time when we are forced in defence of vital British interests to fight ourselves. What would be the position of the Mediterranean then? A clear trade through that area is vital. Nobody can say that within the next few weeks there is any particular trade route which may not be vital to this country. What would be the position if we had to keep a fleet in the Mediterranean? What risks, from the point of view of British interests, would we not run by maintaining our attitude of neutrality?

#### France Entitled to Know.

Well, Sir, we feel strongly that France is entitled to know, and know at once—(great cheers)—what our attitude is to be, whether or not in the event of an attack upon her unprotected northern and western coasts, she could depend upon British support. And in that emergency and under these compelling circumstances, yesterday afternoon I gave to the French Ambassador the following statement:



"I am authorized to give an assurance that if the German fleet comes into the Channel or through the North Sea to undertake hostile operations against the French coasts or shipping, the British fleet will give all the protection in its power."

This assurance is, of course, subject to the policy of his Majesty's Government receiving the support of Parliament, and it must not be taken as binding the Government to take any action until the contingency takes place. So I state this to the House, not as a declaration of war on our part, not as entailing immediate aggressive action on our part, but as binding us to take aggressive action should the contingency arise. I understand that the German Government would be prepared, if we would pledge ourselves to neutrality, to agree that its fleet would not attack the northern coasts of France. I only heard that shortly before I came to the House; but it is far too narrow an engagement—(loud Opposition cheers)—and there is a more serious consideration, becoming more serious every hour—there is the question of the neutrality of Belgium. (Cheers.)

#### Britain and Belgium.

I shall have to put before the House at some length what our position with regard to Belgium is. The governing factor is the treaty of 1839. That is a treaty with a history accumulated since. In 1870 there was war between France and Germany, and the question of the neutrality of Belgium arose. Various things were said, and among other things Prince Bismarck gave an assurance to Belgium, and, confirming verbal assurances, he gave in writing a declaration that the German Confederation and allies would respect the neutrality of Belgium, it being always understood that that neutrality would be respected by the other belligerent Powers. What was our own attitude? The people who laid down the attitude of the British Government were Lord Granville and Mr. Gladstone. Mr. Gladstone said:

"It is not necessary, nor does time permit me to enter into the complicated question of the nature of the treaty, but I am not able to subscribe to the doctrine of those who held in this House that the simple fact of the guarantee is binding upon all those who are parties to it, irrespective of the particular position in which they may find themselves at the time when the occasion for acting upon the guarantee arises. The great authorities to which I have been accustomed to listen never took that rigid and unpracticable view of the guarantee. (Hear, hear.) The circumstance that there is already existing a guarantee in force is of necessity an important factor and weighty element in the case to which we are bound to give full and weighty consideration. There is also this further consideration which we must all feel most deeply, that is the common interest against the unmeasured aggrandizement of any Power whatever.

#### French and German Answers.

Well, I ask myself now: The treaty is an old treaty. It is one of those treaties which are founded not only in consideration for Belgium, which benefits by it, but for the interests of those who guarantee neutrality to Belgium. (Hear, hear.) Our interests are as strong to-day as in 1870, and we cannot take a more narrow or less serious view of our obligations than the view of the importance of the obligations taken by Mr. Gladstone's Government in 1870. I will read to the House what took place last week upon this subject when mobilization began. I knew that this question was bound to be a most important element in our policy

and an urgent subject for the House of Commons to consider. (Hear, hear.) I telegraphed at the same time on similar terms to Paris and Berlin, saying it was essential for us to know whether French and German Governments respectively were prepared to undertake an engagement respecting the neutrality of Belgium. (Hear, hear.)

These are replies:

"The French Government are resolved to respect the neutrality of Belgium, and it would only be in the event of some other Power violating that neutrality that France might find herself under the necessity to act otherwise."

From the German Government the reply was:—

"The Secretary for Foreign Affairs could not possibly give an answer before consulting the Emperor and the Chancellor."

Sir Edward Goschen said he hoped the answer would not be too long delayed. The German Minister for Foreign Affairs then gave Sir Edward Goschen to understand that he rather doubted whether they could answer at all, as any reply they might give could not fail, in the event of war, to have the undesirable effect of disclosing part of their plan of campaign. (Laughter.) I telegraphed at the same time to Brussels to the Belgian Government, and got the following reply from our Ambassador: "The Minister for Foreign Affairs thanked me for the communication, and replied that Belgium would, to the utmost of her power, maintain neutrality. He begged me to add that the Belgian Government believed they were in a position to defend the neutrality of their country in case of violation." (Cheers.)

#### Germany's Ultimatum.

Now, there appears the news I have received to-day—though I am not sure how far it has reached men in an accurate form—the news that an ultimatum has been given by Germany to Belgium, the object of which was to offer Belgium friendly relations with Germany on consideration that she would facilitate the passing of German troops through Belgium. (Laughter and cries of "Shame.") Till one has the news absolutely definitely I do not wish to say all that one would say otherwise. We were sounded in the course of last week as to whether if after a war Belgian integrity should be preserved that would have contented us. We replied that we could not bargain away what obligations we have in regard to Belgian neutrality. (Cheers.)

Shortly before I reached the House I am informed that the following telegram has been received from the King of Belgium by our King George: "Remembering the numerous proofs of your Majesty's friendship and that of your predecessor and the friendly attitude of England in 1870, and the proof of friendship which she has just given us again, I make a supreme appeal for the diplomatic intervention of your Majesty's Government to safeguard the integrity of Belgium." (Cheers.)

#### Diplomatic Intervention.

But the diplomatic intervention took place last week on our part. What can diplomatic intervention do now? (Loud cheers.) We have a great and vital interest in the independence of Belgium. If Belgium is compelled to submit to allow her neutrality to be violated the situation is clear. Even if by agreement she admitted the violation of her neutrality it is clear she could only do so under duress. These smaller



States, the one thing they desire is that they should be left alone—(cheers)—the one thing they fear is that their independence should not be maintained. (Cheers.) If in the war that is before Europe the neutrality of one of these countries is violated, if the troops of one of the combatants violate its neutrality and no action is taken to resent that, at the end of the war, whatever the integrity may be, the independence will be gone. (Cheers.) I have one further quotation, also from Mr. Gladstone, as to what he thought about the independence of Belgium: "We have an interest in the independence of Belgium. It is found in the answer to the question whether this country would quietly stand by and witness the perpetration of the direst crime that ever stained the pages of history and thus become participants in the sin." (Loud cheers.) If it be the case that there has been anything in the nature of an ultimatum to Belgium asking her to compromise or violate her neutrality whatever may have been offered to her in return her independence is gone, and if her independence goes the independence of Holland will follow. (Cheers.) I would ask the House from the point of view of British interests to consider what may be at stake. (Loud cheers.) If France is beaten in a struggle of life and death, beaten to her knees, loses her position as a great Power, becomes subordinate to a Power greater than herself, a consequence which I do not anticipate—(loud cheers)—because I am sure that France has the power to defend herself with all the energy and ability which she has shown in the past, but if that does happen and if Belgium fell under the same dominating influence, and then Holland and then Denmark, Mr. Gladstone's words would come true. Just opposite to us there would be a common interest against the unmeasured aggrandizement of another Power.

#### If We Stand Aside.

It may be said that we might stand aside, husband our strength, and at the end of the war intervene to effect to put things right and adjust them to our own point of view. If in a crisis like this we run away—(loud and prolonged cheers)—from those obligations of honor and interest as regards the Belgian Treaty, I doubt whether, whatever material force we might have at the end, it would be of very much value in face of the respect that we should have lost. (Cheers.) I do not believe that whether a great Power stands outside this war or not it is going to be in a position at the end of the war to exert its material influence. For us, with a powerful fleet which we believe able to protect our commerce, to protect our shores, to protect our interests, if we are engaged in war we shall suffer but little more than what we shall suffer even if we stand aside. Whether we are in it or whether we stand aside, foreign trade is going to stop, not because the trade routes are closed, but because there is no trade at the other end. Continental nations engaged in war—all their population, their energies and their wealth engaged in a desperate struggle—you cannot carry on such a trade as you would carry on in time of peace, whether we are parties to the war or whether we are not. If we stand aside I do not believe for a moment we should be in a position to use our material power to avoid or undo what has happened in the course of the war, to prevent the whole of Western Europe falling under the domination of a single Power, and I am quite sure our moral position will be worse. (Opposition cheers.) I am not yet sure that we know all the facts, but if the facts turn out to be as they have reached us up to the present time it is

quite clear that there is an obligation on the country to do its utmost to prevent the consequence to which those facts will lead.

#### British Mobilization.

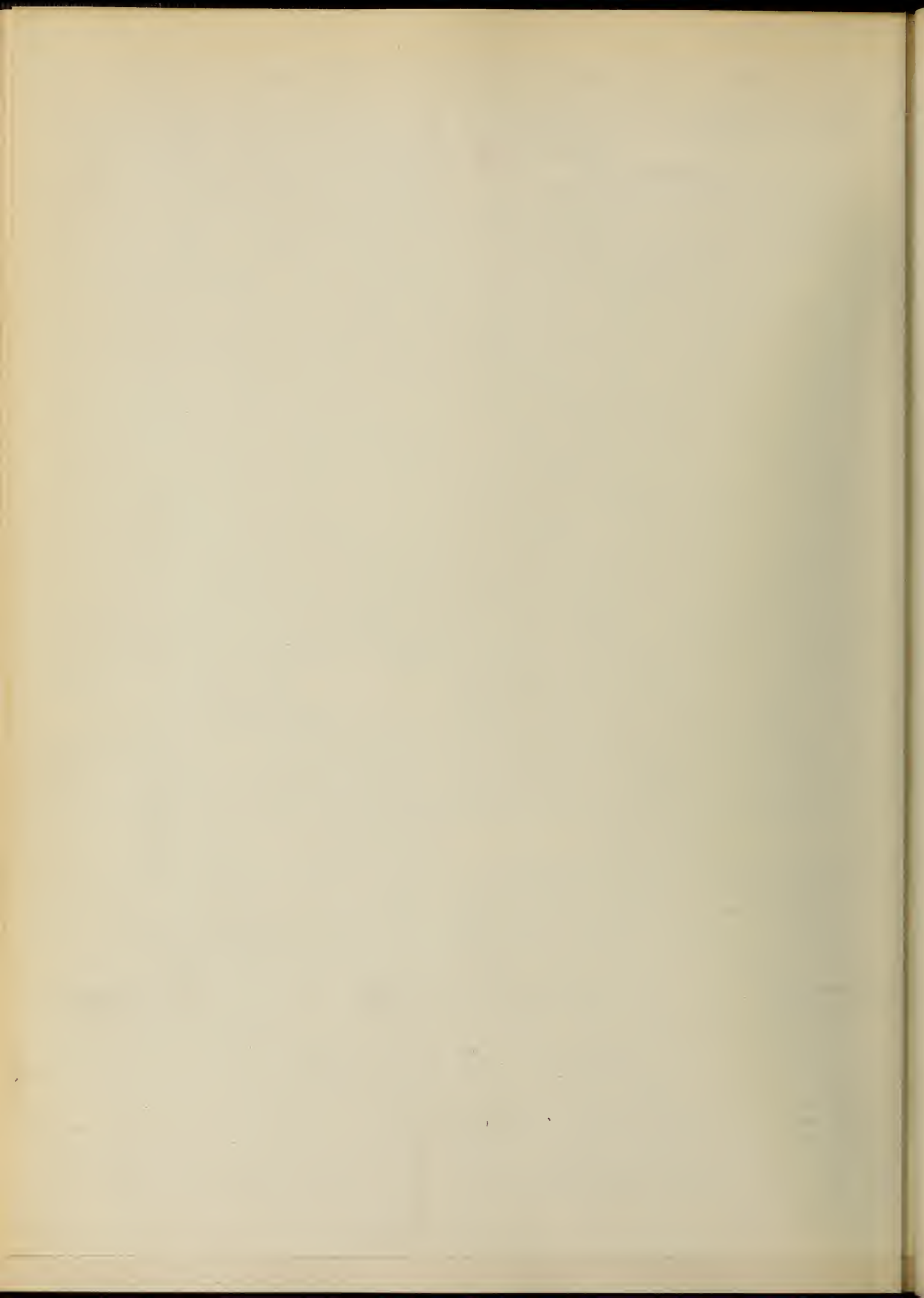
I have read to the House the only engagement that we have definitely entered into. I think it is due to the House to say that we have made no engagement yet in regard to sending an expeditionary armed force out of the country. (Radical cheers.) Mobilization of the fleet has taken place; mobilization of the army is taking place. (Loud Opposition cheers.) Apart from that we have made no engagement because we recognize that we have enormous responsibilities in India and other parts of the Empire. There are unknown factors which we must take very carefully into consideration before we send an expeditionary force out of the country. We must know how we stand. One thing I would say, one of the bright spots in this very dreadful situation is Ireland. (Cheers.) The position in Ireland, and this I should like to be clearly understood abroad, is not a consideration among the things we have to take into account. Now I have told the House how far we have gone in commitment and the conditions which affect our policy. With the question of the violation of the neutrality what other policy is there before the House. There is one way by which we can make certain of keeping outside the area of conflict. It is open to us to proclaim an unconditional neutrality. We cannot do so. (Overwhelming cheering.) We have made a commitment to France which prevents us from doing that. We have the question of Belgian neutrality before us, which prevents us from taking up a position of unconditional neutrality. These conditions have to be satisfied, and we are bound not to shrink from the use of all the force in our power. If we do not take the line I have indicated—and we have to consider Belgian treaty rights, the possible position in the Mediterranean and the results to ourselves and to France through our failure to support her—if we say that these things matter nothing, I believe that we should sacrifice our respect, our name and our reputation, and that we should not escape the most serious economic consequences.

#### We Are Ready.

Well, Sir, my object has been to explain the view of the Government and to place before the House the issues of choice. I do not for a moment assert that what I have said is complete, more especially as to the information I have been able to convey to the House with regard to Belgium. But I have, perhaps, said enough to show that we must be prepared. (Loud cheers.) We are prepared. (Great cheering which continued for over a minute.) We are prepared for the consequences that may arise from the attitude we have adopted. We are ready to take our part. (Renewed cheers.) From the facts as I have stated them, there is nothing pointing to immediate aggressive action on our part, but in the end we may have to resort to force. So far as the forces of the Crown are concerned, we are ready. (Loud cheering.) I believe the Secretary for War (Mr. Asquith) and the First Lord of the Admiralty have no doubt that the readiness and efficiency of the forces under their charge was never before at a higher mark, and that never has there been a time when there was more confidence which was justified in the power of our navy to protect our commerce and to protect our shores. A great responsibility rests upon the Government in deciding and advising the House of Commons what to do.









### Opinion of the Country.

We have to make up our minds to use the information which we have, and I have made it clear to the House, I trust, that we are prepared to face the situation—(cheers)—and that should it develop, as it seems probable to develop, we will face it. (Renewed cheers.) We have worked for peace up to the last moment and beyond the last moment. How hard, how persistently and how fearlessly we strove for peace the House will see when the papers are before it. That is over so far as the peace of Europe is concerned. We are now face to face with the situation and all the consequences which may have yet to unfold. We believe we shall have the support of the House at large in proceeding to whatever consequences may be forced upon us by the development of facts or actions. (Cheers.) I believe that the country, so quickly is the situation forced upon it, has not had time to realize the situation. It is perhaps still thinking of the quarrel between Austria and Servia. The absurdity of the complication of this matter is that Russia and Germany, we know, are at war; we do not know yet officially that Austria, the ally whom Germany is to support, is yet at war with Russia. We know that a great deal is happening on the French frontier; we don't know that the German Ambassador has left Paris. The situation has developed so rapidly that technically as regards the condition of war it is most difficult to describe what it actually is. I wanted to bring out the essential things which affect our own conduct, and to put them clearly before the House of Commons. If we are forced, and rapidly forced, to take our stand upon these issues, then I believe when the country realizes what is at stake, what the real issues are, the magnitude of the impending danger in the West of Europe, then I believe we shall be supported throughout not only by the House of Commons, but by the determination, the resolution, the courage and the endurance of the whole country. (Loud and continued cheers.)

### Leader of the Opposition.

Mr. Bonar Law, who was received with general cheers, said: The right hon. gentleman has made an appeal for support, and it is necessary that I should say a word or two, but they shall be very few. I wish to say, in the first place, that I do not believe there is a single member in this House who doubts not only that the right hon. gentleman himself and the Government which he represents has done everything in his power up to the last moment to preserve peace. (Cheers.) And I think, nay, I am sure, that if any other course is taken it is because it is forced upon us, and there is absolutely no alternative. One thing further only I should like to say. The right hon. gentleman spoke of the bright spot in the picture which only a day or two ago was a black spot in the political horizon. Everything that he has said I am sure is true; but I should like to say this further, that there is another bright spot, and that is that every one of his Majesty's dominions beyond the seas will be behind us in whatever action it is necessary to take. (Cheers.) And this only will I say. The Government already knows, but I give them now the assurance on behalf of the party of which I am leader in this House that in whatever steps they think it necessary to take for the honor and the security of this country they can rely upon the unhesitating support of the Opposition. (Loud cheers.)

### Support From Ireland.

Mr. Redmond (Nat. Waterford): I hope the House will not think me impertinent to intervene in the de-

bate, but I was moved to do so a great deal by that sentence of the Foreign Secretary in which he said the one bright spot in the situation was the changed feeling in Ireland. Sir, in past times when this Empire has been engaged in these terrible enterprises it is true that it would be almost affectation and folly on my part to deny that the sympathy of Nationalist Ireland, for reasons deep down in the centuries of history, have been estranged from this country. But allow me to say that what has occurred in recent years has altered the situation completely. (Cheers.) I must not touch upon any controversial topic, but this I may be allowed to say; that a wider knowledge of the real facts of Irish history has altered the view of the democracy of this country towards the Irish question, and I honestly believe that the democracy of Ireland will turn with the utmost anxiety and sympathy to this country in every trial and danger with which she is faced. (Loud cheers.)

### Labor's Criticism.

Mr. Ramsay Macdonald (Lab. Leicester) said: I would have preferred to remain silent this afternoon, but circumstances do not permit of it. I shall model what I have to say upon the two speeches to which we have just listened. We would vote the Foreign Secretary what money he wants and we would go further, for we would offer him ourselves—if the country was in danger. (Cries of "But it is.") He has not persuaded me that it is, and he has not persuaded my hon. friends with me that it is. I am perfectly certain that when the right hon. gentleman's speech gets into cold print to-morrow he will not persuade a large section of the country. If the nation's honor were in danger we would be with him. There has been no crime committed by statesmen of this character without those statesmen appealing to the nation's honor. We went into the Crimean War because of our honor, we rushed into the South African War because of our honor, and the right hon. gentleman is appealing to us to-day because of our honor. (Loud cheers.) If the right hon. gentleman would come to us and say that a small European nationality like Belgium is in danger—(cries of "It is invaded")—and would assure us that he is going to confine the conflict to that question, then we will support him, but what is the use of talking about going to the aid of Belgium when you are really going into a European war which will not leave the map of Europe as it was before?

The Speaker vacated the Chair at 4.35 and the sitting was suspended.

### Belgian Neutrality.

Sir Edward Grey, who was received with loud general cheers, said: I only want to give the House some information which was not in my possession when I made my statement this afternoon. This information I have received since the House rose from the Belgian Legation in London: "Germany yesterday evening at seven o'clock presented a Note proposing to Belgium friendly neutrality on Belgian territory and promising the maintenance and independence of the country on the conclusion of peace, threatening in case of refusal to treat Belgium as an enemy. (Cries of 'Oh, Oh!') A time limit of twelve hours was fixed for the reply, and Belgium has answered that an attack on her neutrality would be a flagrant violation of the rights of nations; to accept Germany's proposal would be to sacrifice the honor of the nation. (Cheers.) Belgium is firmly resolved to repel aggression by every possible means." (Cheers.)



I can only say that his Majesty's Government has taken into grave consideration the information which has just been received. I make no further comment. (Cheers.)

### THE SPEECHES OF SIR ROBERT BORDEN AND SIR WILFRID LAURIER IN PARLIAMENT WEDNESDAY, AUGUST 19, 1914

In moving the address in reply to the speech from the Throne, Mr. Sutherland struck at once the right note by saying that the present was a time for united action and not for words. He emphasized the long endeavors of Great Britain to avert the war by all means consistent with national honor and treaty obligations. The German-speaking citizens of Canada, he said, were not in sympathy with the military-mad aspirations of a German autocrat.

Mr. Lesperance, seconding the address, declared that all party differences should be laid aside in face of the national danger. He congratulated the Liberal leader on the patriotic stand he had taken in giving the lead in this connection.

#### Sir Wilfrid Laurier:—

In an opening sentence Sir Wilfrid extended his felicitations to the mover and seconder. He had but one criticism or suggestion to offer: he would urge the elimination of all unnecessary formality impeding the way to immediate action.

"The gravity of the event under which we are now assembled," said he, "would seem to make it advisable, would even seem to make it incumbent upon us to disregard the formalities and conventionalities which, in ordinary times, the rules of the House, whether written or unwritten, enjoin as a barrier, a wise safeguard, against precipitate action, and which may, perhaps, on this occasion, either debar us or impede us in consideration of the question with which we have to deal.

"This session has been called for the purpose of giving the authority of Parliament and the sanction of law to such measures as have already been taken, and any further measures that may be needed, to insure the defence of this country, and to give what aid may be in our power to the mother country in the stupendous struggle which now confronts us. Speaking for those who sit around me, speaking for the wide constituency which we represent in this House, I hasten to say that to all these measures we are prepared to give an immediate assent. (Cheers.)

"If in what has been done, or in what remains to be done, there may be anything which, in our judgment, should not be done or should be differently done, we raise no question, we take no exception, we offer no criticism, and shall offer no criticism, so long as there is danger at the front. **It is our duty, more pressing upon us than all other duty, at once, on this first day of debate in the Canadian Parliament, to let Great Britain know, to let the friends and the foes of Great Britain know, that there is in Canada but one mind and one heart, and that all Canadians stand behind the mother country, conscious and proud that she did not engage in war from any selfish motive, for any purpose of aggrandizement, but that she has engaged in war to maintain untarnished, the honor of her name, to fulfill her obligations to her allies, to maintain her treaty obligations, and to save civilization from the unbridled lust of conquest and power.** (Renewed cheering.)

**"We are British subjects, and to-day we are face to face with the consequences which are involved in that proud fact. Long we have enjoyed the benefits of our British citizenship; to-day it is our duty and our privilege to accept its responsibilities, yes, and its sacrifices.**

"We have long said that when Great Britain was at war we were at war; to-day we realize that Great Britain is at war and that Canada is at war also. Our territory is liable to attack and to invasion. So far as invasion is concerned, I do not see that there is any cause for apprehension, for it seems to me obvious that neither Austria nor Germany, our foes in this war, can command any force able to carry out an attack so far from their base. But no one pretends that our maritime cities, either on the Pacific or on the Atlantic, are free from the assault of an audacious corsair, who, descending suddenly upon our shores, might subject us to indignity and insult, and decamp with his booty before punishment could reach him.

"This is not a mere unfounded dread of danger, this is no mere illusion; it is a real and, indeed, approximate danger, since it is a matter of notoriety that both on the Pacific and the Atlantic there are German cruisers whose mission is to inflict all the injury they can upon our commerce, and even make descent upon our cities should they find our harbors unguarded. We are aware that the Government has already taken measures, and very properly so, to guard against this danger. We know that one of our battleships on the Pacific has been seeking the enemy, to protect our commerce and our cities, and if she has not yet engaged the enemy it is because the enemy has eluded her pursuit.

"We have had another and more striking evidence that when Great Britain is at war we are at war, in this, that our commerce has been paralyzed, perhaps the expression would not be too strong if I were to say that it has been to some extent dislocated. From the day when war was declared, nay, from the day when the possibility of war was first mooted, our shipping to Great Britain and to Europe was interrupted. Ships there were lying at the docks fully loaded and ready to take to sea, but unable to take to sea because of the fact that when Britain is at war Canadian property on the high seas is liable to capture, and therefore the ships had to remain in port so long as precautions had not been taken to clear the way and to insure their safe passage across the ocean. What measures have been taken in regard to that we have not yet been informed, but I have no doubt that we shall have that information in due time.

"The correspondence brought down yesterday, however, has informed us that the Canadian Government has already taken steps to send a contingent of twenty thousand men or thereabouts to take their place in the firing line. Let me say that upon this occasion I owe it to the House and to myself to speak with absolute frankness and candor. This is a subject which has often been an occasion of debate in this House. I have always said, and I repeat on this occasion, that there is but one mind and one heart in Canada. In other times we may hold different views as to the methods by which we are to serve our country and our Empire. More than once I have declared that if Britain were ever in danger, nay, not in danger, but if she were ever in such a contest as would put her strength to the test, it would be the duty of Canada to assist her to the utmost of her ability.



"Britain to-day is not engaged in an ordinary contest. The war in which she is engaged will in all probability, nay, in absolute certainty, stagger the world with its magnitude and its horror. But the war in which she is engaged is for as noble a cause as ever impelled a nation to risk her all upon the arbitrament of the sword. That is no longer a question which is at issue, the judgment of the world has already pronounced upon that point. I speak not only of those nations which are engaged in this war with Britain, but of nations which stand neutral, which are not engaged on one side or on the other in this struggle. Take the testimony of the ablest men of those nations, and that testimony is unanimous, it is without dissenting voice, that to-day the allied nations are fighting for freedom against oppression, for democracy against autocracy, for civilization against the reversion to that barbarism in which the supreme law, the only law, is the law of might. (Prolonged cheering.)

"It is an additional source of pride to us that Britain did not seek that war. It is a matter of history, one of the noblest pages of the history of Britain, that she never drew a sword until every alternative had been exhausted to secure and to keep an honorable peace. For a time it was hoped that Sir Edward Grey, who on more than one occasion has saved Europe from the awful scourge of war, would again avert such a calamity. But, sir, it will go down on a still nobler page of history that Britain could have averted this war if she had been willing to forego the position which she has maintained for many centuries as the head of European civilization, to desert her allies, to sacrifice her obligations, to allow the German Emperor to trample upon heroic Belgium, to infringe upon the rights of isolated France, and to put down his booted heel upon continental Europe. At that price Britain could have secured peace. These are the proposals of the German Emperor. The answer of Britain was: 'Your proposals are infamous, and rather than accept them we enter into this war.' There is not to-day all over the universe a British subject, there is not outside the British Empire a single man whose admiration is not greater to-day for Britain by reason of this noble and firm attitude. (Cheers.)

"So to-day Britain is at war. Her fleets are maintaining the freedom of the ocean, her armies have already crossed the Channel for plains made famous more than once by British valor, this time to take a place in the fighting line beside the small and heroic Belgian army, to maintain the independence of Belgium, and to render assistance to the almost as heroic France, whose efforts are to-day concentrated in an effort to repel an invader, and to maintain and to save intact that which to a proud nation makes life worth living.

"I am well aware that the small contingent of some 20,000 men which we are going to send will have to show double courage and double steadiness if they are to give any account of themselves among the millions of men who are now converging towards the frontier of France, where the battle of giants is to be decided. But, sir, it is the opinion of the British Government, as disclosed by the correspondence which was brought down, that the assistance of our troops, humble as it may be, will be appreciated, either for the material help that they give or for the greater moral help which will be rendered, whereby it will be seen by the world that this daughter of old England intends to stand by her in this conflict. (Cheers.)

"When the call comes our answer goes at once. It goes in the classic language of the British answer to the call of duty: 'Ready, aye, ready!' (Renewed cheering.)

"If my words can be heard beyond the walls of this House, in the Province from which I come, among the men whose blood flows in my own veins, I should like them to remember that in taking their place to-day in the ranks of the Canadian army to fight for the cause of the allied nations a double honor rests upon them; the very cause for which they are called upon to fight will be to them doubly sacred.

"We are not all in this country of the same origin; we are not all of British or of French descent. I was struck by the words of the hon. member for South Oxford (Mr. Sutherland), in reference to our fellow-citizens of German origin. They are certainly among our best citizens; this has been acknowledged on more than one occasion. They are certainly proud of the land of their adoption, to many of them the land of their birth, and they have shown more than once their devotion to British institutions. But, sir, they would not be men if they had not in their hearts a deep feeling of affection for the land of their ancestors. Nobody would blame them for that. There is nothing, perhaps, so painful as the situation in which mind and heart are driven in opposite directions.

"But let me tell my fellow-countrymen of German origin that Britain has no quarrel with the German people. We respect and admire, as much as they do, the proud race from which they have descended. We acknowledge all that the world owes to the German people for their contribution to the happiness of mankind through their advancement in literature, in art and in science. But perhaps our German fellow-citizens will permit me to say that in the struggle for constitutional freedom, which has been universal in Europe, during the last century, the German people have not made the same advance as some of the other nations of Europe. I am sure that they will agree with me that if the institutions of the lands of their ancestors were as free as the institutions of the land of their adoption this cruel war would never have taken place.

"Nothing can be truer than the words which are reported to have been uttered by a German soldier made a prisoner in Belgium, that this war is not a war of the people. So if there is a silver lining to this darkest cloud which now overhangs Europe, it is that, as a result and consequence of this war, the German people will take the determination to put an end forever to this personal imperialism, and to make it impossible forever afterward for one man to throw millions of the human race into all the horrors of modern warfare.

"We must know, and we cannot forget, that the issue of battle is always uncertain. Indeed, this has been proved already in the contest which is now going on. Invading Belgium some two weeks ago, the German Emperor invoked the memories of his ancestors, and called upon the blessing of God. The German Emperor might have remembered that there is a treaty guaranteeing the independence, the integrity, the neutrality of Belgium, and that this treaty was signed by the most illustrious of his ancestors in the last century, Emperor William I. of Germany. He might have remembered also that there is a precept in the divine Book to this effect: 'Remove not the ancient landmark which thy fathers have set.'

"But, sir, the German Emperor threw his legions against this landmark in the fulness of his lust of power, with the full expectation that the very weight of his



army would crush every opposition and would secure their passage through Belgium. He did not expect, he could not believe, that the Belgians, few in numbers and peaceful in disposition and in occupation, would rise in his way and bar his progress; or if he harbored such a thought for one moment his next thought was that if he met such opposition he would simply brush it aside by a wave of his Imperial hand.

"Sir, he should have remembered also that in the sixteenth century the ancestors of the Belgians rose against the despotism of Philip II. of Spain, and through years of blood and fire and misery and suffering indescribable they maintained an unequal contest against Spain—Spain as powerful in Europe at that time as the German Emperor to-day. They maintained the unequal contest and never surrendered. Sir, if there are men who forget the teachings of their fathers, the Belgians are not of that class. They have lived up to the teachings of their fathers. The blood of the fathers still runs in the veins of the sons, and again to-day, through blood and fire and miseries and sufferings indescribable, they keep at bay the army of the proud Kaiser. (Cheers.)

"But, sir, I repeat, the issue of battle is always uncertain. There may be disappointments, there may be reverses, but we enter into this fight with the full hope as to the ultimate result.

"For freedom's battle once begun,  
Bequeathed by bleeding sire to son,  
Tho' baffled oft, is ever won."

(Renewed cheers.)

"Sir, upon this occasion we invoke the blessing of God, not the god of battles, but the God of justice and of mercy, and it is with as ample confidence in Providence that we appeal to the justice of our course. Nav, more, already Britain has won a signal battle, a battle more precious, perhaps, than any that will be achieved by her fleets or her armies. It is only some few weeks ago that the Irish problem was pending in the scales of destiny. The possibility of strife in Ireland was a spectacle which already rejoiced the eyes of Britain's enemies. But to-day the spectre of civil war has vanished from Ireland. All Irishmen to-day are united, ready to fight for King and country. The volunteers of the north and volunteers of the south, forgetting their past differences, stand to-day, shoulder to shoulder, ready to shed their blood for the common cause. And, sir, may I not say that the hope is not vain that in that baptism of blood may be washed away, and forever washed away, the distrust of one another which has been the curse of Ireland in ages past. (Prolonged cheers.)

"But it is not only in Ireland that you find this union of hearts. In the two other united Kingdoms the voice of faction has been silenced completely. Even those who, on principle, do not believe in war admit that this was a just war, and that it had to be fought. That union of hearts which exists in the United Kingdom exists in the same way in Canada, in Australia, in New Zealand, yea, even in South Africa—South Africa rent by war less than twenty years ago, now united under the blessing of British institutions, and all British and Dutch stand ready to shed their blood for the common cause.

"Sir, there is in this an inspiration, and the hope is not a vague one, that through painful war the British Empire will emerge with a new bond of union, the pride of all its citizens, the living lesson to other nations."

As Sir Wilfrid concluded the enthusiasm of the entire House spent itself in several moments of unrestrained cheering.

#### Sir Robert Borden:

Sir Robert Borden, who rose following the cheering, was also greeted by prolonged applause by the whole House. Customary references to the mover and seconder were followed by the Premier's tribute to the assistance and counsel of Sir Wilfrid Laurier.

"I have listened with great interest and profound admiration to his patriotic and inspiring speech," said the Premier. He referred to the fact that immediately upon the outbreak of war, before Parliament was summoned, Sir Wilfrid had stilled the voice of party strife, and "with his valued experience and ability had co-operated in every way with those of us upon whom falls the duty at this moment of administering the affairs of this country, in taking all such measures as may be necessary for the defence of Canada and for maintaining the honor and integrity of the Empire whose flag floats over us." (Cheers.)

"In England, as in Canada," Sir Robert went on, "all had joined as one man in the face of the Empire's peril. In England the men who had been most earnest for peace had united with all citizens in upholding the hands of the Government and maintaining the integrity and duty of the Empire. Britain had sought peace, not war. The efforts of the Government to maintain peace had gone to every point save loss of honor.

"War came with startling suddenness," declared the Premier, "but after reading the British white paper and giving it most serious consideration, I am convinced that no Government ever sought with more whole-hearted earnestness to keep the peace of the world and the Empire. For years the whole effort of the British Government has been for peace. Since 1907 it has pleaded with the nations to reduce their armaments. At The Hague it offered to give up what must be regarded as important advantages to induce Germany to abate the race of armaments. Time after time, year after year, on occasion after occasion, the British Government has shown its desire to bring about such conditions in Europe as would make for perpetual peace, and to the last minute in the present crisis the British efforts had been for peace."

In some detail Sir Robert reviewed the events leading up to the war, and the efforts for peace put forward by Sir Edward Grey, "the peacemaker of Europe," and his colleagues in the British Cabinet. "I cannot escape, and no man in this House can escape, the conviction," declared the Premier amid cheers, "that there was a deliberate determination on the part of Austria-Hungary to force war on Serbia regardless of the humiliation of that country and the consequences which war must bring. The most imperious demand ever made on any free nation was made on Serbia by Austria-Hungary, on July 24. Following the outbreak of war the British Government had made every possible attempt at mediation. Every power except Germany had consented to that mediation, but in the end the British efforts were hopeless. The great question which subsequently arose," continued Sir Robert, "was as to the neutrality of Belgium, which had been guaranteed by Germany, France and Britain through past treaties.

"I cannot resist the conclusion," he said, "that it was the deliberate intention of the German Government, formed many years ago, to violate the neutrality of Belgium if war with France should break out."



In honor, Great Britain could not stand by and witness this breach of treaty obligations and the jeopardizing of Belgian independence.

"I agree with what the right hon. leader of the Opposition has said," continued the Premier, "when he declared that we have absolutely no quarrel with the German people. They are not a warlike people. In many respects they have stood in the very forefront of the world's advancement. Many of our best citizens in Canada are of German origin. So far as the Germans and Austrians in this country are concerned, we have adopted the principle that we have no reason to believe that any of them are inspired by the militaristic tendencies which influenced the Governments of Germany and Austria-Hungary. We believe they will be true to their adopted country. They are entitled to the protection of law in Canada, and they shall receive it unless any of them desire to aid and abet the enemy or leave this country to fight for Bri-

Every detail was enabled to be worked out with precision."

Extraordinary steps which would require the ratification of Parliament had been taken by the Government on the outbreak of hostilities. "We took them," said the Premier, "because we believed that in the exercise of our duty we were bound to do so before Parliament could possibly assemble. These steps will be explained later on." Two submarines had been purchased and provided with crews so that the vessels are available "for the defence of our coast and of our shipping if occasion should require." The *Rainbow* had been made ready for war, and her crew supplemented by naval volunteers.

"Great praise is due to those in command of her," continued Sir Robert, "for the courageous act which they undertook in going south, in face of two modern



**His Royal Highness, the Duke of Connaught**  
Governor-General of the Dominion of Canada



**Sir Robert Borden**  
Prime Minister of the Dominion of Canada, and Secretary of State for External Affairs

tain's foes. Up to the present we have seen no disposition among these people to do anything of the kind."

Sir Robert then put before the House some information regarding action taken during the early part of the year, on the suggestion of the British authorities, given in a memorandum from the Overseas Defence Committee to a general defence scheme for Canada. On Jan. 12, 1914, a conference of deputy heads of departments was held, under the chairmanship of Sir Joseph Pope, Under Secretary of External Affairs, with Maj. Gordon Hall of the Militia Department, and R. M. Stevens, Director of Gunnery in the Naval Department, as joint Secretaries. At this and subsequent conferences a general defence scheme was drawn up and detailed plans were made for action to be taken by executive officers at Ottawa should war break out at any time.

"I cannot overestimate the great advantage which resulted to the Government from having these matters thought out in advance," Sir Robert said. "Necessary arrangements which came from time to time before the Government were made without the slightest confusion.

German cruisers, to assist in bringing back the small boats *Algerine* and *Shearwater*, which were then in the south. The *Niobe* has also been put in commission, as she possesses some fighting strength, and she will be manned in part by the crews of the *Shearwater* and *Algerine* and in part by British naval reservists. All of these boats have been placed under the direction of the Admiralty, under the authority contained in that behalf in the naval service act of 1910.

"In my telegrams to the British Government," said the Premier after reading a number of despatches to the House, "I spoke of the united spirit of Canada, and events have shown that I was not mistaken. The men who are going to the front from Canada are going as volunteers, free men from a free country, to serve this Dominion and this Empire. I express absolute concurrence with the view put forward by the member for South Oxford (Mr. Sutherland), that it is the duty of the people and the Government of Canada to make all suitable provision for the families of those going to the front. We are giving our best to our country, and



we are proud to do it. Neither the people nor the Government will ever forget the duty to those who are left behind.

"The leader of the Opposition has alluded to the uncertainty of human events, and particularly events such as are before us in the great war which now confronts the Empire and our own people. True, the future is shrouded in uncertainty, but I believe that the people of Canada look forth upon it with steadfast eyes. But let me say that while we are now upborne by the exaltation and enthusiasm which come in the first days of a national crisis, so great that it moves the hearts of all men, we must not forget that days may come when our patience, our endurance and our fortitude may be tried to the utmost. In those days let us see to it that no heart grows faint and that no courage be found wanting.

"In the awful dawn of the greatest war the world has ever known, in the hour when peril confronts us such as this Empire has not faced for a hundred years, every vain or unnecessary word seems a discord. As to our duty all are agreed, east and west, and shoulder to shoulder, with Britain and the other British Dominions in this quarrel. And that duty we shall not fail to fulfill as the honor of Canada demands. Not for love of battle, not for lust of conquest, not for greed of possession, but for the cause of honor, to maintain solemn pledges, to uphold principles of liberty, to withstand forces that would convert the world into an armed camp, yes, in the very name of the peace that we sought at any cost, save that of dishonor, we have entered into this war, and while gravely conscious of the tremendous issues involved and of all the sacrifices that they may entail, we do not shrink from them, but with firm hearts we abide the event." (Prolonged applause.)

#### ADDITIONAL SILVER.

Mr. Lloyd George has announced that additional silver is being coined in Great Britain.

On August 6 "The Financier," London, said: "According to leading authorities the silver position is not likely to be materially affected either way, despite the probability of the Mint having to augment its output of silver coinage considerably to meet the bulge in paper currency. The suggestion that the production from the Cobalt camp could be accelerated in order to relieve the position does not appear to be practicable, as it is stated that the mines are already producing to their full capacity. It is satisfactory to learn, however, that there will be no curtailment of operations from this quarter. As to whether the portion of the metal which at present is taken by China will be diverted it is difficult to say, but authoritative quarters take the view that it will not be necessary, as the camp should be able to cope with the probable increase in the demand on home account."

#### MOND NICKEL.

At an extraordinary general meeting of the Mond Nickel Co., Ltd., on Aug 6, a resolution was passed increasing the capital from £1,700,000 to £2,400,000 by the creation of 700,000 seven per cent. non-cumulative preference shares of £1 each. Sir Alfred Mond, M.P., who presided, said the programme of which this increase of capital formed part was arranged long before there was any idea of present events occurring. The object was to raise further capital when opportunity offered for the development of the business.

## GRAPHITE IN GOLD ORE FROM KIRKLAND LAKE DISTRICT, ONTARIO

By John A. Dawson.

The occurrence with gold ore from the Kirkland Lake district of a dark material of shining bluish black lustre, has been referred to in several articles in the Canadian Mining Journal. This substance has been sometimes called molybdenite, although the softness and brittleness of this material as well as its association indicate that it is graphite.

A sample taken from Vein No. 1 of Tough-Oakes mine by Mr. R. E. Here was given to the writer for analysis. This sample weighed 590 grams and was about two by five inches, with a thickness of about two inches. Considerable native gold and pyrites could be seen on the selvage faces and particularly along a thin dark seam throughout the quartz-calcite-chlorite gangue. On the flatter of the two lateral faces, the dark material occurred in thick films over the other minerals. About twenty grams of this black substance was chiselled off and analysed.

On charecoal under the oxidizing flame of the blow-pipe, the material gave a reddish brown residue after prolonged heating. No coating was formed. Upon heating with the ordinary acids, the material was unaltered in appearance.

A quantitative analysis was carried out according to the methods given in Fresenius and in the U. S. G. S. Bulletin, No. 176. Careful tests for molybdenum established the absence of this element. No residue was obtained on igniting the precipitate obtained by adding mercurous nitrate reagent to the weakly alkaline solution of the carbonate fusion of the material, indicating the absence of chromium, vanadium, molybdenum, tungsten, phosphorus and arsenic. Copper was also absent. Tellurium was determined by reduction with sulphur dioxide. Carbon as graphite was estimated by oxidation with chrome and sulphuric acids and weighing the carbon dioxide formed.

From the accompanying analysis it will be seen that gold is present in relatively large proportion and appears to be all in the form of sylvanite (Au, Ag) Te<sub>2</sub>, since the percentage of gold, silver and tellurium present correspond to this mineral.

Analysis of black ore from Tough-Oakes mine:

	Pct.		Pct.
SiO <sub>2</sub> . . . . .	63.05	ZrO <sub>2</sub> . . . . .	0.02
Al <sub>2</sub> O <sub>3</sub> . . . . .	5.02	TiO <sub>2</sub> . . . . .	0.02
Fe <sub>2</sub> O <sub>3</sub> . . . . .	0.02	Te . . . . .	0.25
CaO . . . . .	1.00	Au . . . . .	0.17
MgO . . . . .	0.43	Ag . . . . .	0.09
K <sub>2</sub> O . . . . .	2.32	C (graphite) . . . . .	15.03
Na <sub>2</sub> O . . . . .	0.60	FeS <sub>2</sub> . . . . .	10.95
H <sub>2</sub> O . . . . .	1.44		
BaO . . . . .	0.07		100.48

James Berry, a fire boss at the Western Fuel Co.'s Reserve Shaft mine, situated about five miles from Nanaimo, Vancouver Island, B.C., met with a tragic death on August 12. He fell down a shaft 900 ft. in depth and was instantly killed. Prior to his removal to Vancouver Island two years ago he was employed at the Crow's Nest Pass Coal Co.'s colliery at Michel, South-east Kootenay.



## THE DOMINION COAL COMPANY, LIMITED

The Dominion Coal Company is the largest single coal operator in Canada, producing in 1913 thirty-eight per cent. of the entire coal output of the Dominion, and seventy per cent. of the coal output of Nova Scotia. The company in 1913 produced 4,739,149 tons of coal.

The amalgamated collieries taken over by the Dominion Coal Company at its incorporation in 1893 numbered eight, namely, four mines on the Phalen Seam, one on the Lorway Seam, and one on the Emery Seam, all these being in the Glace Bay Basin. In the Waterford District there was the Victoria Mine, on the Victoria Seam, and in the Morien District there was one colliery on the Blockhouse Seam. A policy of concentration was decided upon, and all the collieries except those in the Glace Bay District were closed down.

Lingan Seam, Nos. 15 and 16, were added in the Waterford District. In 1912, No. 21 Colliery was opened to a producing stage in the Morien District, and No. 22 Colliery in the same district was completed in 1913. In 1913 the Emery Seam was entered at a point closely adjoining No. 3 Colliery, the new mine being known as No. 11. The Old Victoria Mine, in the Waterford District, which was closed down in 1897, was pumped out during 1913, and became once more a producer in the early part of 1914.

At the beginning of 1914, therefore, the company had in operation 20 collieries.

During the summer of 1914 the company expects to obtain daily outputs from the collieries aggregating 22,000 tons.



No. 1 Colliery (Dominion), Phalen Seam. Shows the Pressed Steel Hopper Cars used on the Railway.

In 1899 the company was operating four mines only, namely No. 1 (Dominion), No. 4 (Caledonia), and No. 5 (Reserve), all on the Phalen Seam, and No. 8 (International) on the Harbor Seam. In 1900 a new opening was made on the Phalen Seam, known as No. 3 Colliery, to which was allotted a territory lying between the workings of No. 4 and No. 5 Collieries. In 1901 were added Nos. 2 and 9 Collieries, operating the Phalen and Harbor Seams. The old Hub Colliery (No. 7) was re-opened in 1903, and in 1905 No. 6 Colliery was opened on the Phalen Seam, and No. 10 Colliery was commenced on the Emery Seam at Reserve Mines.

The practically virgin coalfield of the Lingan-Victoria areas—now known as the Waterford District—was opened up in 1907, Nos. 12 and 14 Mines, on the Victoria Seam, becoming producers in 1908 and 1909 respectively. In 1911 the collieries of the Cumberland Coal & Railway Company were acquired by the Dominion Coal Company, and two further new collieries on the

The coal areas of the company in Cape Breton Island compose the most valuable and desirable portion of the Sydney Coalfield, and it may be safely stated that, with the exception of the areas of the Nova Scotia Steel & Coal Company, there is but a negligible extent of the Sydney coalfield that is not under lease to the Dominion Coal Company.

The Sydney Coalfield, because of the purity, accessibility and quantity of its coal seams, and its proximity to good harbors, holds a first place in Canadian coalfields. The main basin has a superficial area of from 200 to 250 square miles on land. The extent of the submarine area cannot be more than conjectured, but the geological indications are that the land area, extending for 32 miles from the crop of the Millstone Grit at Mira Bay to the pre-Carboniferous range of hills which have their seaward termination in Cape Dauphin, is the "segment only of an immense basin extending towards the coast of Newfoundland."



**Dominion No. 2 Colliery**

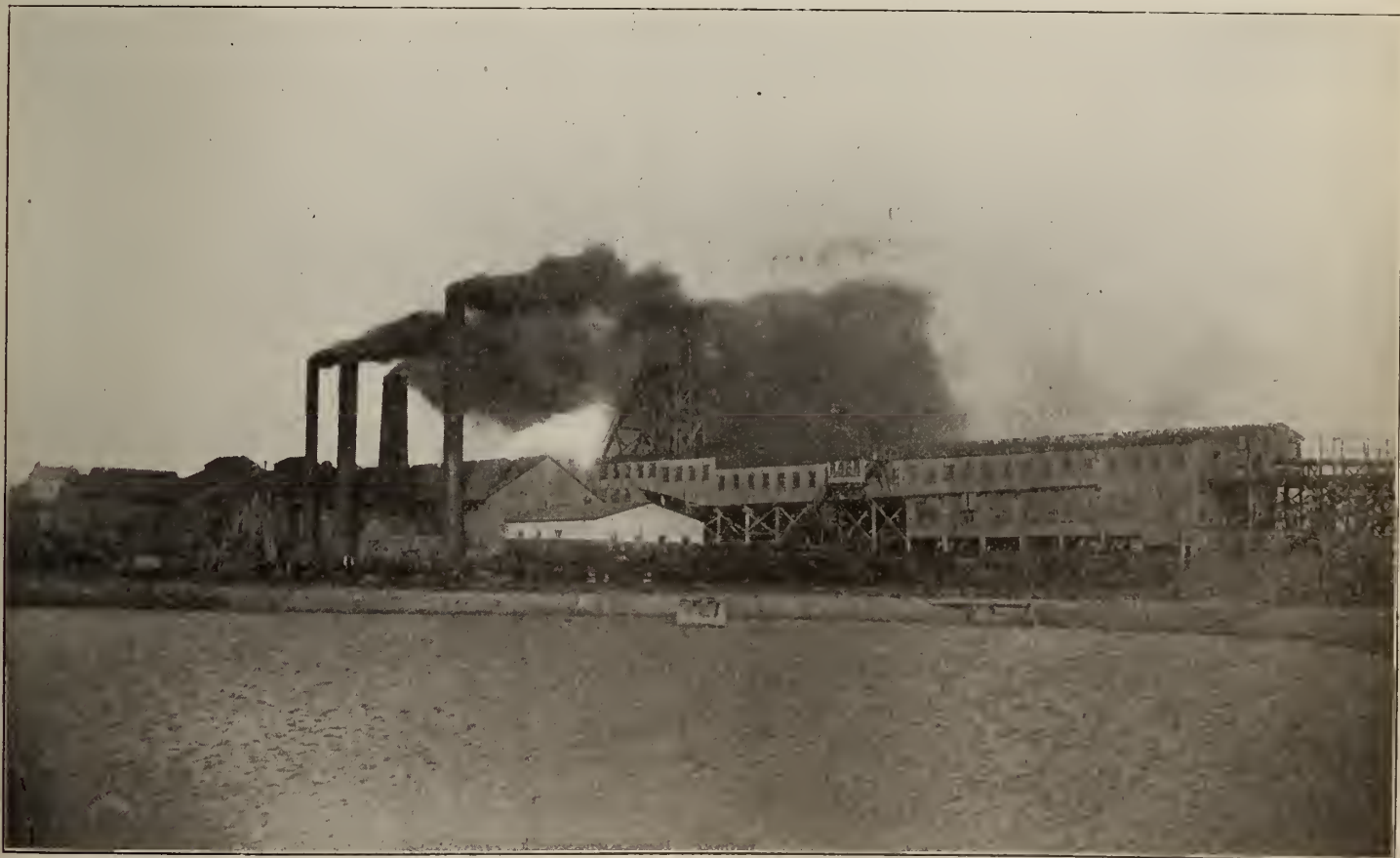


**No. 4 Colliery (Caledonia), Phalen Seam**





**Dominion No. 3 Colliery (Phalen) From the Rear.**



**Dominion Nos. 5 and 10 Collieries (Reserve Mines), Phalen and Emery Seams. Head Office is over Emery Shaft.**



The Sydney coalfield is traversed by three parallel folds, evidently subsequent in date to the deposition of the coal seams, which divide the main basin into four subordinate basins, which beginning from the south-east, are known as the Morien Basin, the Glace Bay Basin, the Lingan-Victoria Basin, and the Sydney Mines, or Bras d'Or Basin.

The Dominion Coal Company has under lease the whole of the workable portions of the Lingan-Victoria and Glace Bay Basins, the most desirable portion of the Morien Basin; and the whole of the submarine areas between the great Bras d'Or entrance and Sydney Mines, with the exception of the areas now being operated by the Nova Scotia Steel & Coal Company.

The most complete section of the coal-seams is to be found in the Lingan-Victoria tract. To the eastward some of the higher seams have their outcrops concealed by the sea, and to the westward the characteristics of the seams are altered, so as to make their correlation uncertain with present knowledge, although this presents no insuperable difficulties to systematic research. The following section of the Lingan-Victoria measures may be taken as typical of the submarine coalfield which adjoins the Coal Company's land areas now being mined:

#### Section of Productive Coal Measures in Lingan-Victoria Basin.

Local Name of Seam.	Thickness of Measures.		Total Depth.
	Ft.	In.	
Carr Seam . . . . .	3	0	170
Strata . . . . .	170	0	
McNeill Seam . . . . .	3	5	176
Strata . . . . .	341	0	
Barachois Seam . . . . .	6	0	523
Strata . . . . .	55	0	
Dunphy Seam . . . . .	3	0	581
Strata . . . . .	306	0	
Victoria Seam . . . . .	7	0	894
Strata . . . . .	257	0	
Fairy House . . . . .	3	5	1,154
Strata . . . . .	66	0	
Northern Head . . . . .	5	0	1,225
Strata . . . . .	113	0	
Lingan Seam . . . . .	8	0	1,346
Strata . . . . .	134	0	
Emery Seam . . . . .	2	8	1,483
Strata . . . . .	1,000	0 (?)	
Mullins Seam . . . . .	6	0	2,489

**Submarine areas.**—The workings in three seams have been continued from the land mines into submarine territory with no important change in the thickness, quality or general characteristics of the seams, and there is no reason to anticipate any limitation of the extension of the submarine seams except those which may be expected to be attendant upon the extraction of coal at long distances from the shafts on land. Submarine coal seams are to-day being successfully extracted at a distance of over five miles from shore, and as the submarine areas of the Coal Company have been barely entered, and may for all practical purposes be termed virgin, it will be seen that the coal reserves controlled by the company are sufficient for many generations, even at a much augmented rate of extraction.

An important feature of the Coal Company's holdings is that in each of the four subsidiary basins of the Sydney coalfield the company control the land areas which enable access to the submarine areas.

As some indication of the great coal reserves of the company it may be pointed out that in the submarine area off the Glace Bay Basin there are seven workable seams contained within a depth of 1,300 ft., the individual seams being so spaced that they can be worked without interfering one with another, with ordinary precautions. Below this depth there are several other seams which will at some future date be worked. Only four of the seams have so far been worked in the Glace Bay Basin. In the Lingan-Victoria tract only two of the many workable seams have as yet been mined, and these two only to a very limited extent. The seams in the Point Aconi District are untouched, and very little has been taken out of the submarine areas in the Morien Basin. The workings of the topmost seam in the Glace Bay Basin, the Hub Seam, have reached a point  $1\frac{1}{4}$  miles seawards from the shore line, and the workings of the Nova Scotia Steel & Coal Company have extended over two miles under the sea. The Nova Scotia Steel & Coal Company is now driving through an area owned by the Dominion Coal Company and leased to the Scotia Company with the intention of reaching the Scotia areas which lie outside those of the Dominion Company. To reach these outer areas the Scotia Company will have to extend the workings  $3\frac{1}{4}$  miles in submarine territory, and so far as can be determined the continuity and persistence of the coal-seams seawards is for all practical purposes indefinite.

**Land area.**—The workings on the Hub, Harbor and Phalen Seams in the land area of the Glace Bay Basin are quite extensive, and some of the older mines, such as No. 5, No. 3, and No. 8, are approaching exhaustion, but the lower seams have been worked very little more than has served to prove their existence and quality. At No. 3 Colliery and at No. 5, the Emery Seam has been opened up so as to utilize the plant and houses attached to these mines for the working of the Phalen Seam. The same procedure can be followed at each of the other mines when the upper seams show signs of exhaustion.

Below the Emery Seam lie three or four other seams, waiting for development whenever this becomes necessary or desirable.

**Enormous reserve.**—Various estimates have been made of the quantity of coal which can be profitably worked from the Dominion Coal Company's areas. A carefully calculated estimate recently made showed the workable coal to total five thousand million tons, but for any practical purpose it may be stated that the company's areas are inexhaustible, and at the present rate of production would last for at least 300 years. In the twenty-one years that the Coal Company have been incorporated, including the year 1914, the mines have produced sixty million tons of coal. In the next twenty-one years it is probable that this quantity may be doubled, but even then the depletion of the company's areas will be scarcely appreciable when considered in relation to their enormous coal reserves.

**Cumberland Co. areas.**—The areas controlled by the Dominion Coal Company in Cumberland County, under a lease from the Cumberland Railway & Coal Company, comprise approximately 190 square miles of coal lands situated in the most productive portion of the Cumberland coalfield.

Five workable seams of coal are contained in the areas, varying from 4 ft. to 13 ft. in thickness. Three seams, which vary from 10 ft. to 13 ft. in thickness, are worked by two separate slopes having separate bank-heads and screening plants. The seams are highly in-



clined, varying according to locality from 28 degrees to vertical. The mines are fiery and no explosives or mechanical coal-cutters are used in the extraction of coal. Electricity is not used underground.

The production of the present two slopes is about 1,600 tons per day. Diamond-drill prospecting has proved a considerable area of workable coal underlying the seams now being worked, and at a future date one or two new openings will, in all probability, be made on these lower seams.

The Springhill coals are characterized by excellent analysis, being low in sulphur and high in fixed carbon.

Since the Dominion Coal Company took over the mines, additional boiler capacity and ventilating machinery has been provided and compressed air has been substituted for steam for underground haulage and for pumping from the lower lifts.

headwaters of the St. Lawrence, has necessarily become almost as much a transportation company as a mining enterprise.

The Sydney & Louisburg Railway is owned and operated by the Coal Company. The main line is 40 miles long, with branches and sidings extending a further 70 miles and connects the collieries with the shipping piers of the company on the harbors of Sydney and Louisburg.

Although the Sydney & Louisburg Railway exists chiefly for the strictly utilitarian purpose of hauling coal from the collieries to the shipping piers, a not inconsiderable tourist traffic is attracted in the summer by facilities which the Mira river affords for outdoor camping and recreation, and by the remains of the French fortifications at Louisburg.

The equipment of the railway is designed to move



**Dominion No. 7 Colliery—Hub Seam as rebuilt after the fire—Rescreening Plant in Foreground.**

The company owns and operates the Cumberland Railway connecting the mines with the Intercolonial Railway at Springhill Junction, a distance of five miles to the north of the collieries, and with well equipped shipping piers at Parrsboro on the Minas Basin arm of the Bay of Fundy, situated thirty miles to the south of the mines. The rolling stock comprises six locomotives, six passenger cars, and about two hundred and forty coal cars.

The company owns about ninety miles of timberlands, situated around the mines, about one-half of which is still untouched, part of the remainder being culled. The whole of the timber required for the operation of the mines and railway is obtained from these areas.

**Transportation.**—The Dominion Coal Co. by reason of the geographical situation of its collieries, and that its principal sales territory is around Montreal and the

heavy trains of coal and during the summer of 1914 the railway will be required to handle over half a million tons of coal per month. The equipment comprises 31 locomotives, about 30,000 tons capacity of steel and wood hopper cars, 5 steam shovels for loading coal from the storage banks, and the necessary equipment of passenger cars, freight and flat cars, snow ploughs, etc.

Although in the spring months the drift ice on the coast is a hindrance to shipping the harbors of Sydney and Louisburg are so placed as to make it possible to ship coal the whole year round, except on very exceptional occasions.

At Louisburg the shipping pier is equipped with special storage pockets and conveyors for the storage and quick shipment of slack coal.

On Sydney harbor the company has two modern and well-equipped shipping piers. A third pier, now disused, will shortly be dismantled. The Sydney piers will



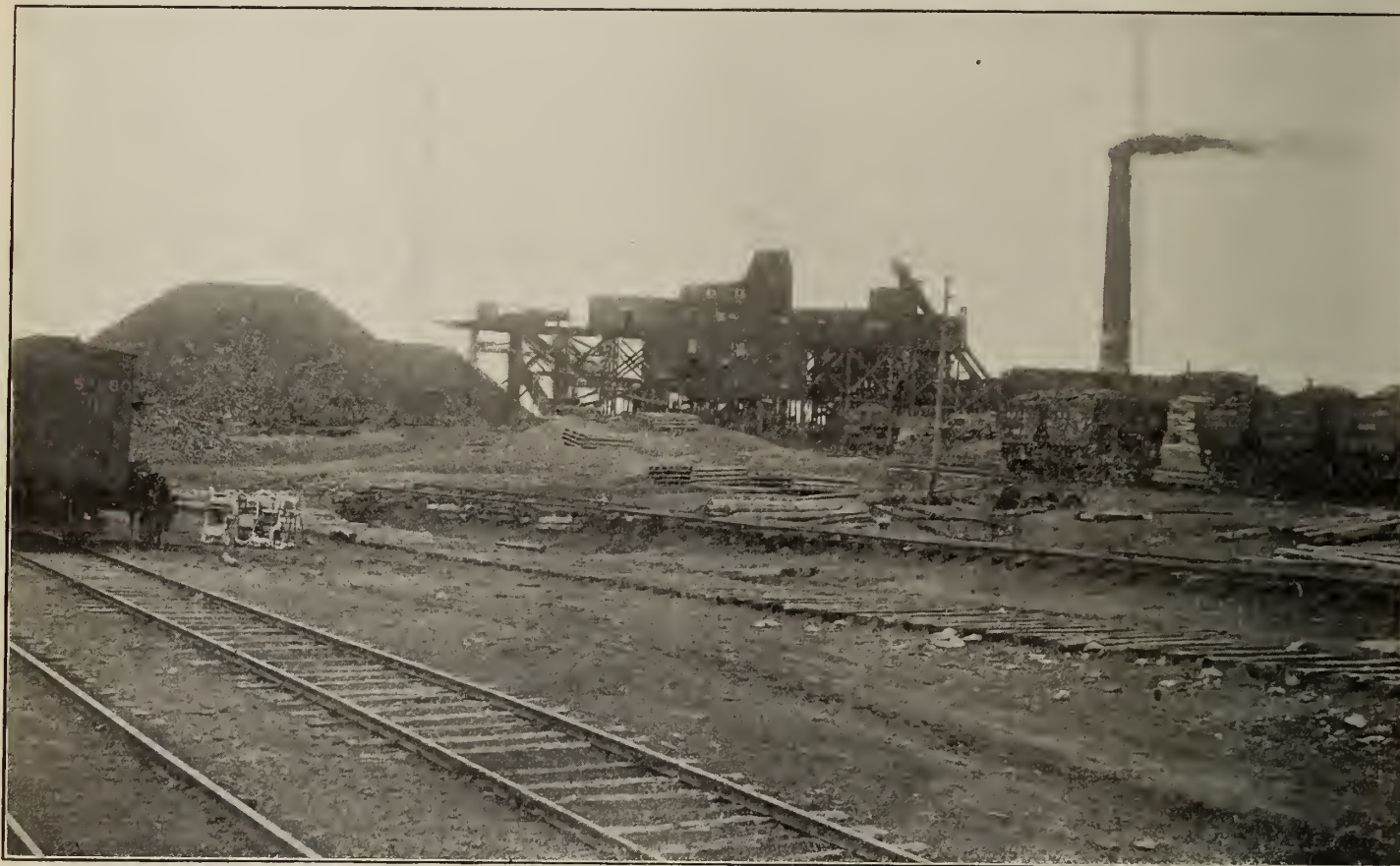
accommodate the largest coal freighters afloat, and can berth three large steamers at one time. Up to 40,000 tons of coal can be shipped every 24 hours. The colliers in the company's freighting service have a deadweight capacity varying from 7,000 tons to 11,000 tons, and are designed with large unobstructed holds into which the coal can pour quickly without any hand trimming. The company's piers are also specially equipped for the bunkering of steamers, to which quick despatch can be given at any time of the year.

The company has very completely equipped discharging and stocking plants at Montreal, Three Rivers, Quebec, St. John, N. B., and Halifax, N.S.

During the summer of 1914 over two million tons of Dominion coal will be shipped from Sydney and discharged at the St. Lawrence ports, chiefly at Montreal. In order to deal with this large quantity of coal in the

the coal requirements of that market for the whole year, compels the company to stock large quantities of coal during the winter. At the opening of navigation in May, 1914, the company had in its various coalbanks roughly 640,000 tons, all of which will be lifted from the banks and shipped away before the end of October.

**Mining practice.**—The mining practice of the company is as modern as it is possible to make it. The seams are all bituminous, clean and free from dirt bands, very uniform in general character and remarkably free from troubles or faults. The dip varies in the different basins. In the Glace Bay districts it does not exceed eight per cent. In the Lingan-Victoria tract the inclination varies from twelve to thirty per cent., but it may be said that in the greater portion of the company's areas the inclination of the coal-seams is moderate, and that little difficulty is attached to the



**Dominion No. 8 Colliery (International), Harbor Seam.**

season of open navigation in the St. Lawrence it is necessary to ship between 90,000 and 100,000 tons of coal per week, or to despatch at the piers every day two to three steamers loaded with from 7,000 to 11,000 tons of coal each. It is not surprising therefore that the most familiar sight on the St. Lawrence river is a "Black Diamond" coal boat, one of an endless procession coming and going between Sydney and Montreal from the beginning of May to the middle of November.

The bulk of the coal shipments is of course carried by chartered steamers, but the company own and operate the Black Diamond Steamship Line which comprises five coal-freighters, several sea-going tugs, and two combined passenger and freight steamers plying between Montreal, Prince Edward Island, Sydney and Newfoundland.

The closing of the St. Lawrence river by ice during the winter, and the necessity to deliver sufficient coal in the St. Lawrence ports during the summer to supply

mining of the coal from this cause.

In the thicker seams the general method of mining is by "pillar and stall" workings, and in the thinner seams a modified system of longwall is employed. The coal is undercut almost entirely by machinery, cutters of the percussive-pick type and the radial percussive-pick type being used in the room workings and in development work, and disc longwall-cutters in the longwall workings. The motive power employed is compressed-air. The blasting of the coal is carried out by shot-firers paid by the company, and in every mine where the presence of gas has been reported all blasting is done with electrically-fired detonators and "flameless" explosives.

Safety lamps are used in all the mines without exception. The lamp which has been standardized throughout the company's mine is a magnetically-locked, electrically-ignited lamp, which cannot be opened except in the lamp-cabin, and which can be re-lit if extinguish-





**Dominion No. 15 Colliery—Lingan Seam.**

ed in the mine by placing it in an electric re-lighter, without the slightest danger.

**Fire prevention.**—Special attention has been paid by the company to the question of fire-prevention and fire-protection. Each colliery has a trained volunteer fire brigade, and a system of water hydrants. Portable chemical fire-extinguishers are distributed throughout the surface buildings and at important points underground, and the pipe ranges underground used for the transmission of compressed air can be turned into water mains quickly, if necessary to deal with an underground fire.

As an adjunct to the fire-fighting equipment, the company has provided some 60 sets of oxygen breathing apparatus. The main station is placed about the centre of the Glace Bay Collieries, and subsidiary stations had been provided at Springhill and Waterford, in addition to the provision of sets of apparatus for immediate use at the outlying collieries. The equipment of the stations is most complete, and a constant training of rescue-corps has been going on for the past seven years. The

Dominion Coal Company had the first "rescue-station" equipped on this side of the Atlantic.

**Power.**—For many years past the company has been effecting improvements in connection with the generation and transmission of power and the utilization of slack coal and inferior grades of fuel. A comprehensive scheme of electrification at the collieries has been carried towards completion, and at the newer collieries no steam power is used except for heating buildings in the winter. At No. 2 colliery there is an electric generating plant consisting of three 5,000 k.w. units and one 1,000 k.w. exhaust steam turbo-generator.

At Watford Lake in a convenient position for serving the new collieries in the Waterford District is a very up-to-date power-plant consisting of two 2,000 k.w. live-steam turbo-generators, with provision for a third unit when required. The boiler plant consists of four Bettington boilers and four Babcock & Wilcox boilers, equipped with Taylor stokers. The Bettington boilers are the first of their kind to be erected on this side of the Atlantic and use dust-fuel injected under pressure.



**No. 2 Mine, Springhill.**



At the three most recently completed colliery plants in the Waterford District the coal is hoisted by electrically-operated hoisting engines. The air-compressors, ventilating fans, underground pumps, bankheads, screening plant, and all the small colliery plant in the Waterford District is electrically operated. In the Glace Bay District the greater portion of the screening, ventilating and pumping machinery is electrically operated, and at the two new collieries in the Morien District the entire plant is electrically operated.

**Washery.**—In 1913 the company erected a Baum coal washery, near the International piers in Sydney, capable of washing 120 tons of slack coal per hour, this being the first Baum washery to be erected in America. The wash plant buildings are substantially constructed of concrete, cement brick and steel, and, in addition to the washery proper, concrete storage pockets have been

about 2,400 single dwellings of varying grades, nine large workmen's hotels and 220 boarding-houses, tenement blocks and shacks. The rent of the miners' cottages varies from \$4.00 to \$8.00 per month. The class of house recently erected for the miners contains four rooms and a kitchen, with a front verandah, surrounded by a good sized plot of land sufficient for garden use. The necessity for housing provision is shown by the fact that the company rents to its workmen houses from \$7.00 to \$8.00 per month for which private landlords in the vicinity obtain from \$10.00 to \$15.00 monthly. The population housed in the company's property is not less than 15,000 persons.

The relief of the work people in sickness and accident is provided by the Dominion Coal Company's Employees' Benefit Society, which was formed in 1910 by a consolidation of the Miner's Relief Societies which have existed



No. 3 Mine, Springhill. (1) Blacksmith Shop, (2) Fan, (3) Bank, (4) Incline, (5) Boilers.

provided which will hold six thousand tons of washed product. Including the dry slack bins, the bins in the washery itself and the storage pockets, the plant has a total coal storage capacity of 9,000 tons. This ample storage provision will enable quick dispatch of steamers when loading washed slack, as the distance from the wash plant to the pier is short.

**Employees.**—It is worthy of note that the increase in the population of Nova Scotia, as shown by the last census returns, is entirely accounted for by the increase in the population of the Island of Cape Breton. In Cape Breton itself the work people of the Dominion Coal Company number between 10,000 and 11,000, of which number some 8,000 people are employed in and about the mines, the remainder being employees of the railway and auxiliary departments.

The increase in the population being entirely due to the extension of the company's operations, it has been necessary to expend large sums of money on the provision of housing for the work-people. The company owns

in one form or another at the Cape Breton Collieries for over thirty years past. This society has now about 11,500 members, including the Springhill employees. The relief paid covers both sickness and accident and, in fact, any form of disability which does not arise from improper or immoral conduct. The relief paid to members of the fund is \$6.00 per week for twenty-six weeks; \$3.50 per week for a further twenty-six weeks; followed by \$2.00 per week for two years, at which time, if the disability continues, special grants may be made at the discretion of the managers of the society. The widow of a deceased member receives \$8.00 per month for five years and \$3.00 per month for each child until it reaches the age of fourteen years. The management of the society is vested equally in the company and the employees. The workmen contribute 50 cents per month and the company make a contribution equal to that of the workmen. The accumulated funds of the society at the end of 1913 were \$210,000.00. During 1913, there was paid out in relief of sickness and accident \$87,272.00; for death



claims \$9,608.00, and to the widows and dependents of deceased members \$21,853.00. At the end of 1913 there were on the funds 122 widows and 329 children.

**Market.**—The market territory of the Dominion Coal Company covers the Maritime Provinces and Newfoundland and the districts bordering on and at the head of the St. Lawrence river to about the vicinity of Brockville, Ontario. This territory is in extreme length about 1,200 miles, and some of the principal centres of population are Montreal and Quebec in the Province of Quebec; St. John, New Brunswick; Halifax and Sydney, Nova Scotia; Charlottetown, Prince Edward Island, and St. John's, Newfoundland. For many years the company has supplied the New England Gas Company at

vide a growing market for the production of the company's collieries, as there is good reason to believe that the manufacturing and railway activities of the Maritime Provinces are in but the first stage of growth. The coal needed in the allied steel industry is an increasing quantity, and the future will doubtless see the founding of many industries based on bye-products of the steel and coal industries, and on the proximity of cheap fuel to excellent water-transportation facilities, which the immediate vicinity of the Sydney coalfield itself affords. The many industries now existent in the Province of Quebec, particularly around Montreal, are firmly established and must grow with the general expansion of the Dominion.



Waterford Lake Power House

Boston, Mass., with gas-coal, principally slack-coal, and has sold a little coal for railway purposes in the State of Maine.

About 40 per cent. of the sales are made in the St. Lawrence territory, 28 per cent. is used in the works of the Dominion Iron & Steel Company, 24 per cent. is sold to customers in the Maritime Provinces, and seven per cent. is marketed in the United States.

United States coal competes very closely with Dominion coal in the Montreal market, particularly during trade depression in the United States. A protective duty of 59 cents per ton on bituminous round coal, and 15½ cents per ton on slack coal, is imposed on United States coal coming into Canada. There is no duty on anthracite coal.

The steadily increasing population and wealth of the eastern portion of Canada can be relied upon to pro-

As elsewhere noted the transportation of the Coal Company's output of coal to market destination must necessarily be by water, and so far as the shipments to the St. Lawrence are concerned, the closing of the river by ice in the winter would necessitate a marked disproportion between summer and winter production, were it not that the works of the Dominion Iron & Steel Company afford an outlet for the output of the mines during the season of closed navigation. The Dominion Iron & Steel Company and the Dominion Coal Company constitute the main subsidiaries of the Dominion Steel Corporation. The alliance of these basic industries, together with the potentialities of the sales territory served by the Coal Company's mines and the ample coal, iron-ore and limestone reserves controlled by the Dominion Steel Corporation guarantee the permanence and future expansion of the operations of the Corporation.



# THE MILL AND METALLURGICAL PRACTICE OF THE NIPISSING MINING CO., LTD., COBALT, ONT.

By G. H. Clevenger.

(Continued from last issue.)

C. J. Reed has pointed out that reduction of a metal from one of its compounds by solution of another metal is not due to nascent hydrogen evolved by dissolving the metal added but to the electromotive force which is maintained by the energy of the dissolving metal.

I was familiar with the work of Walker and Martin a number of years before we began the Nipissing investigation and had considered the possible application of this method of reduction as a preliminary treatment for silver ores which were to be cyanided. But it had seemed to me that as the practice of fine grinding and various other refinements in the cyanidation of silver ores, or ores in which silver predominated, developed, extractions had reached such a high stage in the majority of cases that there was little room for the introduction of an extra operation with its attendant complication and expense, even though at the outset it were conceded that a slightly better or possibly a more rapid extraction could be obtained. It must be remembered that most silver minerals (there are exceptions) are soluble in cyanide solutions of proper strength when reduced to a sufficiently finely divided state and given the proper time of contact. This is even true of Nipissing low-grade ore. But with certain of the ores, excessively fine grinding is required and an almost prohibitive time of contact to recover the last of recoverable silver. Judging from a rather extensive experience in the treatment of silver by the cyanide process, together with the fragmentary and at times contradictory data available upon the solubility of silver minerals in cyanide solutions, I am forced to believe that there is a great difference in the rate of solubility of the same silver mineral occurring in different localities.

At Virginia City, Nev., the predominant silver combinations are the sulphides and sulpho-antimonides. My experience with Comstock ores covering many small-scale tests as well as actual mill operation, for a considerable period, is that these ores are favorable for cyanide treatment either direct or in combination with concentration.

The more recent experience of Whitman Symmes at the Mexican mill, Virginia City bears this out, as he has very successfully treated these ores without concentration or other preliminary treatment. This is often true of the ores from other districts in the United States and Mexico where the sulphide and sulpho-antimonide minerals of silver predominate. It is, however, true that the same degree of comminution, strength of solution in alkaline cyanide, and a period of contact is not in all cases equally effective. It is therefore evident that there is a very marked difference regarding the solubility of the sulphide and sulpho-antimonide minerals occurring in different districts, and even at times in the same mine. There are unquestionably many plants now treating ores in which the sulphide and sulpho-antimonide of silver predominate where it would not prove profitable to introduce this preliminary treatment. However, it should be realized that there might be special cases where it would be advantageous.

The use of this preliminary reduction in other districts should therefore be approached with caution and only adopted after it has been clearly demonstrated that the extraction is sufficiently improved or facilitated to produce an additional profit above the cost of the extra operation involved.

**Precipitation.**—The author seems to be strongly of the opinion that zinc dust could not have been used as a precipitant in the Nipissing low-grade mill on account of the fouling of the solution as solutions containing arsenic and zinc were shown to give a diminished extraction.

E. M. Hamilton is also of the same opinion, but J. J. Denny is not so sure that it would not have been possible to overcome the difficulties which arose when zinc was used as a precipitant. In some of the experiments which he made in which zinc dust was used, he found that after the solution was allowed to stand eight days, it recovered its original dissolving power, but he was at a loss to explain this phenomenon. A very plausible explanation for this is apparent when the behavior of zinc precipitation in treating the high-grade ore is considered. Apparently, so far as I have been able to observe, this difficulty does not arise in treating the high-grade ore although the amount of deleterious impurities as well as zinc passing into solution is many times that encountered with the low-grade ore. The cyanide concentration is of course much higher, which is not without its influence; but further than that the real explanation seems to be that the arsenic, antimony, etc., separate during and after precipitation from the solution to a concentration which does not interfere under the conditions of treatment maintained. The percentage of zinc is also reduced upon standing as well as by reactions which take place when the solution comes in contact with a fresh lot of ore and the mercury during amalgamation.

Shortly after starting the high-grade plant, I observed that there was a considerable amount of finely divided black precipitate being carried over from the foot of the precipitation boxes into the sump. This was at first thought to be a silver precipitate in suspension due to the violent action in the boxes, but it was soon demonstrated that it contained a relatively small proportion of silver. At times the solution leaving the foot of the boxes would be a clear wine color. A sample of this colored solution when allowed to stand in a glass beaker for some time became the color of the ordinary solution while at the bottom of the beaker there was deposited a black precipitate. R. B. Watson gives the following analysis of the precipitate which collects in the bottom of the sumps at the high-grade mill:

	Per Cent.		Per Cent.
Silver. . . . .	0.394	Iron. . . . .	5.040
Mercury. . . . .	2.510	Nickel. . . . .	9.060
Antimony. . . . .	3.300	Cobalt. . . . .	7.030
Arsenic. . . . .	32.640	Lime. . . . .	9.240
Sulphur. . . . .	16.130	Carbon dioxide . .	7.259
Silica. . . . .	5.362	Manganese. . . . .	trace
Zinc. . . . .	2.257		



It is evident that these impurities are much more difficult to precipitate than the silver for they seem to separate largely at the foot of the precipitation boxes, and indeed a part of it goes over as a colloidal solution from which the precipitate separates completely, only after standing several days in the sump tanks. It might be mentioned that agitation seemed to facilitate this separation. In precipitating the solutions from the first large-scale tests by zinc-shaving precipitation, the wine-colored colloidal solution was noted at times at the foot of the precipitation boxes. However, in general, it was not apparent with the low-grade ore on account of the much smaller percentage of the deleterious elements which it contains. In general zinc-shaving precipitation throughout my tests gave very complete and satisfactory precipitation; but it must be remembered that conditions were somewhat different than those obtaining in the treatment later developed. My own observation together with facts given by Denny, lead me to think that zinc precipitation under proper conditions would not have been impossible in the cyanidation of Nipissing low-grade ore. However, it would, no doubt, have required a very careful investigation of the conditions governing the separation of the undesirable impurities from solution during and after precipitation.

Perhaps the chief interest in the discussion of this feature of Nipissing practice centers about its applicability elsewhere. This is a subject which must be approached with considerable caution for despite the general prejudice which has existed against zinc since the cyanide process was first introduced, zinc has in the great majority of cases been giving most excellent results, particularly when used in the form of zinc dust. This statement is made as a result of a most critical consideration of the whole field of precipitation with a view of finding a substitute for zinc which would perform all its functions. The use of aluminum or even aluminum dust as a precipitant, is by no means a new idea so that if it did not possess some very obvious disadvantages it would have come into general use as precipitant for gold and silver from cyanide solutions long ere this. I am inclined to think that its future use will be still confined to special cases.

Carl Moldenhauer first proposed the use of aluminum as a precipitant and obtained a patent for its use in 1893.

Early experiments with it by Julian in South Africa in the form of plates and shavings with solutions containing gold, did not prove satisfactory.

S. F. Kirkpatrick began experiments in 1906 with aluminum dust as a precipitant and states that, when used in the form of dust, the difficulties experienced by the earlier experimenters are overcome. Nevertheless, it is difficult to see how this could have any effect upon the formation and separation of alumina from the solutions. The use of aluminum dust was first applied commercially by the Deloro Mining & Reduction Co. in 1908 and was in use as late as June, 1913, in connection with the cyanidation of the speiss resulting from the smelting of Cobalt high-grade ores. The same interests introduced its use at the O'Brien mill, in the Cobalt district, where, although in use about three years, it attracted but little attention. The general character of the ore treated at the O'Brien mill is similar to that treated at the Nipissing low-grade mill. Rough concentration is practised prior to cyanidation.

Butters has sought to overcome some of the difficulties of aluminum-dust precipitation by a system em-

ploying granulated aluminum in a tube mill through which the solution to be precipitated is passed during rotation of the mill. The bulk of the precipitate is to be collected by subsequently passing the solution through a filter press.

In order to come to the point, let us ask a few pertinent questions: First, is aluminum-dust precipitation cheaper than zinc-dust precipitation? (of course in this connection we must give due consideration to all factors, even those having an indirect bearing upon the subject); second, is there any function which it would not perform which zinc does; third, is it as effective for dilute solutions containing a small proportion of metal as is often encountered in treating low-grade gold ores?

The average consumption of aluminum dust over a period of nine months, is given as being 1 lb. avoirdupois for each 3.104 lb. avoirdupois of silver precipitated. In the Pachuca district it has been regular practice with a Merrill zinc-dust precipitation system to precipitate 1 lb. of fine bullion per pound of zinc dust, and with a double circuit system of precipitation even better results have been attained. There is no doubt that this result could be duplicated or bettered at the Nipissing low-grade mill, for in general with zinc precipitation, the greater the proportion of silver in the solution to be precipitated, other conditions being the same, the higher the efficiency.

E. M. Hamilton gives the cost of zinc dust laid down at the Nipissing plant at 7c. per pound while aluminum dust costs 35 to 39 cents per pound. Suppose that no charge is made for the caustic soda necessary with aluminum or the extra power necessary for agitation, or no allowance for the cyanide carried down with the alumina which sooner or later must separate from the solution, and no credit is given the aluminum for cyanide regenerated, we find that the actual cost of precipitating a pound of silver with aluminum would be 11.3 to 12.5 cents, while with zinc dust, the cost of precipitating a pound of silver would be 7 cents. Upon this hypothetical basis, the costs are very much in favor of zinc. The cyanide regenerated has of course a most important bearing upon the cost of precipitation as the value of all that is saved should be deducted from the total cost of aluminum precipitation. I prefer to use the term, saved, rather than regenerated, for the reason that cyanide may appear to be regenerated, as indicated by titration at various stages of the process, and still this may not constitute a real saving in the amount eventually used.

The regeneration of cyanide noted is 1.67 lb. per ton or 408 lb. per day. And as this is given as one of the practical benefits gained by a change in the mill plan from zinc dust to aluminum dust precipitation, it deserves careful consideration. (Zinc dust was never used in the completed mill). In other words, it is claimed that there would have been required 1.67 lb. per ton of ore treated or a total of 408 lb. per day additional cyanide if zinc precipitation had been used.

This claim for cyanide regenerated is evidently based upon the difference between titrations made upon the solutions before and after precipitation. There will be considerable difference of opinion regarding just how much weight should be given determinations of this kind as indicating the amount of cyanide which would actually be saved to a plant through aluminum or any other form of precipitation. As having a direct bearing upon this question, the extreme view of Hamilton is quoted:



"Some may dispute the ground I take when I count as lost the cyanide that remains combined with zinc, because it is often stated that the double cyanide of zinc and potassium is almost as efficient for dissolving purposes as the simple cyanide. My experience is, however (at any rate in the case of silver ores), that the reading obtained by the use of potassium iodide indicator with excess of caustic, is worthless as a measure of the dissolving power of a cyanide solution, the efficiency being for practical purposes proportional to the 'free' cyanide reading obtained by stopping at the first faint opalescence without the use of potassium iodide indicator."

Now if we concede this saving in cyanide, claimed through precipitation with aluminum, it is necessary for us to agree with Hamilton's statement regarding the absolute loss of all cyanide combined with zinc, and concede the entire effectiveness of that liberated by aluminum.

Most operators will disagree with this extreme view, but regarding the degree to which cyanide combined with zinc becomes, later, available for extraction there would of course be a great diversity of opinion.

Hamilton's wholesale condemnation of the use of potassium iodide as an indicator is the result of making too rigid comparisons between titrations made with and without its use. This is proven by the fact that the operation of many cyanide plants is controlled with entire satisfaction by the Liebig titration, employing potassium iodide as an indicator.

With aluminum precipitation, it is necessary to add caustic soda just prior to precipitation, and as aluminum does not even temporarily combine with cyanogen, all the cyanide regenerated is at once apparent by the ordinary Liebig titration without an indicator.

With zinc precipitation, the addition of an alkali to the solution prior to precipitation is not necessary and in the great majority of cases would be a distinct disadvantage as it would result in a greatly increased solution of zinc with its attendant disadvantages. However, suppose we add caustic soda to the solution, after zinc precipitation, and then make titrations as before, we find that there has been a considerable regeneration of cyanide, for reasons already made sufficiently clear. Now this is just what happens in practice as the alkali is added after precipitation, or generally with the ore in the form of lime and therefore comes in contact with the solution as each fresh charge of ore comes under treatment. During treatment, regeneration is going on to a greater or less extent during the whole period. The rather slow regeneration which takes place during treatment when zinc precipitation is used is not without its advantages as the cyanide is gradually freed from the combination as needed. That this makes for a somewhat lower cyanide consumption, is proven by the general experience of there being a less cyanide consumption in regular mill practice than when starting a new mill when there is no zinc in solution, or as indicated by small-scale tests in which fresh solution is used.

There are perhaps other causes which contribute to this, but this factor undoubtedly accounts for a large part of the difference. Regeneration taking place during treatment is not apparent by titration as decomposition of cyanide is going on at this period at a more rapid rate than regeneration. While there are other reactions taking place during treatment which cause

regeneration such as dilution, etc., yet the principal influence appears to be the addition of alkali. With zinc precipitation it is therefore apparent that the various reactions which cause regeneration only take place when the solution is applied to the treatment of a fresh lot of ore when zinc separates and cyanide becomes available for extraction, while with aluminum precipitation all the factors contributing to regeneration are present at the moment of precipitation.

Unfortunately, this indirect regeneration, as we may term it, is not readily capable of direct quantitative determination as in the case of aluminum precipitation, so that the only way to make direct comparisons of the regeneration taking place in each case, would be to run the same plant upon the same ore for separate periods of time of considerable length, employing both forms of precipitation. A comparison between the actual amount of cyanide consumed in each case would tell the tale. When one has all the evidence before him, he is compelled to admit that there is regeneration of cyanide at certain stages of the process when zinc precipitation is employed, and remembering Julian's statement that alumina and this is the form in which aluminum separates from cyanide solutions, carries down with it cyanide, it is very evident that the saving in cyanide at the Nipissing mill, through the use of aluminum precipitation, is not so great as has been claimed.

Zinc, in solution, is not without its advantages, as it serves a useful function in removing soluble sulphides and to a certain extent, in acting as a protector for the cyanide temporarily combined with it. An example of the important function which zinc at times may perform in cyanide solutions, is the experience of Colbath when treating ore from a certain stope in El Rayo mine. The extraction decreased to a considerable extent, and trouble arose with precipitation. Coincident with these difficulties, it was noted that the zinc had disappeared from the solutions to the extent that the titration for total cyanide coincided with that for simple cyanide. Lead acetate was tried as a remedy, but it did not prove effective, so the rather startling experiment of adding zinc in the form of potassium zinc cyanide was tried.

This addition of zinc caused the extraction and precipitation to again become normal. This unusual case, where there was not zinc enough supplied to the solutions through precipitation, very forcibly draws attention to the important function which zinc stands ready to perform. Ordinarily, sufficient zinc is supplied to the solutions through solution of zinc during precipitation. Evidently, in certain cases, aluminum precipitation could not perform all the functions that zinc precipitation does.

It seems to me that the process of reduction and aluminum precipitation work remarkably well together under the Nipissing conditions, for the possible disadvantage of caustic soda carried over from the reduction process, if zinc precipitation were used, becomes an advantage with aluminum precipitation. The caustic soda thus carried over and that added during precipitation on account of antimonial compounds, is a decided aid to the extraction of the silver. The preliminary reduction treatment presumably removes compounds which would tend to form soluble sulphides so that the non-effectiveness of aluminum for the purpose of removing them, is of little moment in this particular case.



## PREVENTION OF MINING ACCIDENTS

Mr. T. F. Sutherland, Chief Inspector of Mines, in a bulletin published by the Ontario Bureau of Mines, says that the provisions of the Mining Act of Ontario are as a rule well observed by the companies, very few accidents being caused by failure on the part of the mining companies to observe these provisions. Nevertheless the accident rate in Ontario mines is not decreasing; on the contrary, during the past 24 months the fatalities in and about the mines of Ontario have shown a marked increase. Investigations into these accidents show that a large proportion are due either to ignorance or carelessness on the part of the employees. This is owing in a great measure to the class of labor which must now necessarily be employed. The old-time type of experienced miner, proud of his skill as an all round miner, is rare in Ontario camps. His place is taken by the man with ability to do only one thing—a hammer drill runner is no good in a drift; the man in the drift is not a shaft man, etc. Foreign labor in Ontario mines, which is a large proportion of the whole, is drawn from the agricultural sections of Europe. The only knowledge of mining which most of these men have is what they acquire after going to work underground in this country. Many of them are unable to understand English, yet invariably pretend that they understand any order given them. They frequently view accident and death with callousness and indifference, and resent any attempt to enforce rules and regulations even when such rules and regulations are for their own protection. The English-speaking miner is, as a rule, a young man. He is intelligent and bright, but lacks a realization of the dangers to which he is exposed, and is inclined to take a chance. These two types include about 80 per cent. of the men employed, and it is towards the prevention of unnecessary accidents among these men that the efforts of the management should be directed. It is not sufficient that the ordinary safeguards be provided and that these men be expected to look after their own safety. The accident records prove that they are not capable of this—they lack the Safety First viewpoint. Frequently in discussing an accident the remark is made, "You would think a man would have more sense than to do a thing like that." Such being the case, it is absolutely imperative, if improved results are to be obtained, that special provisions be made for safeguarding this class of labor. The results obtained by the Beaver, Buffalo, Nichols Chemical Co., Canadian Copper Co. and the Steel Company of Canada show that the only satisfactory method of dealing with this problem is not to trust to the men to protect themselves, nor expect the management, captain, shift bosses, etc., to protect the men, but to form a separate department, under a distinct head, whose duty it is to educate the men to look after themselves, and also to see that all regulations pertaining to safety, etc., are carried out. In certain large companies a safety engineer is appointed and safety committees organized at the different plants; at smaller companies, like the Beaver and Buffalo, a mine inspector is appointed, whose duty it is to find out and report to the management any dangerous places or practices.

### Safety System at Buffalo Mines, Cobalt.

A safety system was introduced at the Buffalo Mines, Cobalt, by General Superintendent Tom R. Jones on December 11th, 1911. An inspector was appointed, who has filled the position since that time. All un-

derground men pass through his office when going on and off shift. Those going off shift report the number of holes blasted, missed holes and refires, if any; also any breakages to machines. Between shifts, all working places are visited by the inspector, who marks with a red flag any missed holes, loose ground, chutes hung up, and any broken timber or ladders. The men going on shift are watched as to their fitness to go underground; miners are informed by him of the condition of their working places, also of any repair parts needed for their machines or equipment; sealers are directed to places where there is loose ground, and timbermen to make repairs before going to their regular place of work. The daily inspection includes all pipe lines and tracks, as well as the working places. A general inspection is made every Monday of all workings in the mine and of the condition of the cables, cages and hoists. The inspector has authority to dismiss men when neglecting to exercise due care in their work.

## AMERICAN MINING INSTITUTE MEETING.

About 300 members attended the one hundred and eighth meeting of the American Institute of Mining Engineers, held at Salt Lake City, Utah, from Monday, Aug. 10, to Friday, Aug. 14. It was a very successful meeting and brought out papers and discussions of more than ordinary importance. The list of papers on metallurgical practice was an unusually strong one, and the Institute is to be congratulated on the series of papers now appearing in the Bulletin.

There were few Canadians at the meeting. Mr. J. B. Tyrrell, of Toronto, was present and extended the good wishes of Canadians to our American friends.

## MINERAL EXHIBIT.

Ontario will have a mineral exhibit at the National Exhibition this year as usual. Mr. T. E. Rothwell, assistant assayer, will be in charge. The Ontario exhibit always attracts much attention.

## LIFTING AND SHIFTING MACHINERY.

The British War Office has purchased from the Herbert Morris Crane & Hoist Co., a very large quantity of lifting and shifting machinery to be used directly in connection with the preparation of war materials. The well-known policy of the Herbert Morris companies to carry large stocks of machinery is being amply justified in the great struggle which is now going on in Europe. It is also finding justification in Toronto as the company has a large stock and is ready to meet any call which may be made on it.

"The Young Man and the Electrical Industry" is the title of a story written by James H. Collins, and has just been issued by the Westinghouse Electric and Manufacturing Company. The little book deals with the opportunities afforded a young man in this industry and the different lines in which he may direct his activities as exemplified by the works of the Westinghouse Electric Company. The company announces that it will supply a copy to anyone interested in the development of young men.



## PERSONAL AND GENERAL

Mr. D. L. H. Forbes has been appointed chief construction engineer of the Chile Exploration Co. His address is Chuquicamata, Chile.

Mr. C. P. Hill, of Montreal, is in Victoria, B.C., in connection with his interest in coal mining properties on Vancouver Island.

Mr. Frederic Keffer, of Greenwood, B.C., lately received a hurried call to New York State, where his sister is seriously ill.

Mr. M. K. Rodgers recently journeyed by automobile from New York via Chicago, Illinois, and Butte, Montana, to the Boundary district of British Columbia. After visiting the Granby Consolidated Co.'s smelting works at Grand Forks and big copper mines at Phoenix, he proceeded to Hedley, Similkameen. He was accompanied by several members of his family throughout his long trip.

Mr. J. A. Swanson, for years general foreman for the Granby Consolidated Co. at Phoenix, B.C., has removed thence to the company's Hidden Creek mines, near Anyox, Observatory Inlet, in the same Province, where he will take a similar position to that so long filled at Phoenix.

Mr. J. H. Tonkin, general manager for the Pacific Coast Coal Mines, Ltd., with headquarters in Victoria, B.C., was recently taken ill with appendicitis. During his illness Mr. C. P. Hill has assumed charge of the company's affairs on Vancouver Island.

Mr. Fred M. Wells, of Vancouver, B.C., has been examining mining property in the southern part of Vancouver Island, where there are promising indications of the occurrence in quantity of copper and gold ores.

Mr. Roy Wethered, of Spokane, Washington, formerly of Ainsworth, was a recent visitor to parts of Slovan district.

Friends of Mr. Douglas Clermont Livingston will be glad to know that although his name has been listed in one publication among those of "deceased" members, he is still "alive and kicking," and creditably filling the office of head of the mining engineering department of the University of Idaho, U.S.A., with Moscow as his place of residence.

The Canadian General Electric Co. has issued a bulletin entitled "Electricity in Coal Mining."

Renouf Publishing Co., Montreal, announces the publication of "Useful Minerals and Rare Ones," a little book by Alexander McLeod.

## SPECIAL CORRESPONDENCE

### PORCUPINE, KIRKLAND LAKE AND SESIKINIK

Unlike any other part of the industrial communities of the Province the European war has left Porcupine absolutely untouched; not half a dozen men have lost their jobs as a consequence. The producing mines are naturally unaffected and the developing mines appear to have been so adequately financed that operations will be continued.

The Hollinger is proceeding with unabated energy to the development of ore. There are now ten more stamps dropping, making 50 in all, and the four weekly crushing record can be raised to 1,800 tons any time the management wishes. Good progress is also being made with the big power plant on Gillies lake, and the sprinkler system will soon be installed throughout

the principal buildings of the Hollinger mine and mill.

The last four-weekly statement shows that the surplus is now \$901,938, while considerable sums are being written off for improvements as they are made. The costs are still slowly going down. For the last four-weekly statement they were \$4,332 a ton against \$4,667, the average for the first six four-weekly periods of this year. But the average value per ton dropped to \$13.62 against an average of \$14.25 so that the net profit per ton is approximately the same. It was explained that the extraction had gone down to 91.0 per cent., due to the fact that changes are being made in the cyanide end of the plant, necessitating the stacking of some concentrate. The main vein has been cut at the 675 ft. level and the ore and its width are quite up to the average.

**Mill extensions.**—Good progress is being made with the extension to the mill at the McIntyre mine and also at the Vipond. Underground work at the Vipond is quite satisfactory to the management.

**The bush fire** which threatened South Porcupine wiped out the plant of the Foley O'Brien, even the shaft timbers catching on fire at one time. Beyond that no mines were materially damaged though the staff of the Little Pet had to fight fire for some days. The danger is now pretty well over since rain has fallen.

**Porcupine Crown.**—Results on the 200-ft. and the 500-ft. level of the Porcupine Crown are promising as indicating extension of orebodies. Beyond the fault to the south on the 200-ft. level the main vein has been picked up and is showing a fair grade of ore.

**At Kirkland Lake** the Tough-Oakes continues to mine all the ore in sight and to restrict operations to strictly remunerative purposes. Several English syndicates, notably the one working the Hunton, have closed down since the war started. The Nipissing has taken full charge of the Teek-Hughes and has laid plans for developments on a considerable scale. It is known that the management consider that the prospect is one worthy of much attention.

**Tellurides.**—Black minerals associated with native gold on the Smith-Labine the Maloof Fraction, the Lindberg Farm and the Taylor Fraction at Sesikinika have been identified as tellurides.

A number of the pure specimens show 20 per cent. gold, 20 per cent. tellurium and 40 per cent. silver. This is probably petzite. Hessite also occurs in Sesikinika ores. It is considered likely that other tellurides, notably sylvanite and salavertite, will be found on further exploration and examination.

The veins in Sesikinika vary from six in. to a ft. in width, the gold occurring with the tellurides at irregular intervals. Most of the veins are capped over and appear as quite insignificant on the surface. Very little work has been done so far beyond stripping; but prospecting is very easy as fires have recently been through the country and burnt off all the moss and undergrowth.

### COBALT, GOWGANDA SOUTH LORRAIN

**The silver market improves.**—The serious demoralization of the market for silver ore from the Cobalt camp which followed the news of the declaration of a general European war is gradually disappearing and there is now every confidence that the situation will continue to improve gradually.

At first the situation was most ominous. Avenue after avenue for the sale of silver closed and for a



time there was but one group steadfastly in favor of remaining open and producing. Practically every mining company announced a reduction of the force of men but most of them decided to stay open for a week or two in the hope that the horizon would clear. The first to make a definite statement of closing down was the Kerr Lake mine, which was quite unexpected as this property has made great headway this year and has a big surplus. But orders from headquarters were imperative and the mine was closed down fast, not even the office staff being retained. The Drummond Fraction, which was also partly under Kerr Lake influence shut down at the same time.

A few days later the Beaver closed down and as the Timiskaming had stopped work some weeks previous to the breaking out of the war the shock to the Kerr Lake and to the camp was great. Last week the Buffalo and the Seneca-Superior closed down. The Seneca-Superior is keeping the pumps going and running one drill on exploration work, which had been necessary for some time. The Buffalo has this week put four drills or exploration work and part of the mill is being run.

The Beaver mill may be run on the dump but it is not likely that the mine will reopen for some time and the manager has gone on an extended trip to the States. The Crown Reserve has cut down its staff materially. All the married men are being retained and as many of the single men as is consistent with economy in the present condition of affairs.

Apart from this there has been no laying off of men at all.

Last week the Timiskaming Mine Managers Association got into communication with the government at Ottawa through the Hon. Frank Cochrane, representative for the district of Nipissing. Previously Mr. C. H. Lloyd manager of the Imperial bank at Cobalt had urged that bank should accept bullion as collateral and make an advance on it. This the bank did not appear willing to do without some further security. The matter was then taken up with Ottawa and the Canadian Bankers Association, and the Timiskaming Mine Managers Association was requested to lay a statement before the Minister of Finance. This they later did in a message couched in strong terms urging that the banks be empowered to make advance on bullion so that more mines should not close down and the conditions of unemployment grow worse. The message made the statement that 1,200 men were then out of work through the camp. The Hon. Frank Cochrane interested himself in the matter and finally sent a message back to the effect that the arrangements asked for had been made.

They are to this effect. Mines can lodge their bullion in a bank and the bank will advance for the operation of the mine not more than 30 cents an ounce on the amount turned in. This will be loaned at the rate of 6 per cent. If necessary the government under the arrangements can be called upon to accept the bullion as collateral and guarantee the loans. That removes the danger that the mines with small reserves will have to close down.

But the situation in regard to some of the companies shipping raw ore or concentrates has not changed materially yet as the American Smelting and Refining company refuses to accept silver ore from Cobalt. There remain the two Canadian smelters but they are looking after ore from the mines with which they are affiliated and taking care of the parties already contracted with for a definite time. The companies that are sending ore to the Nipissing are also able to get their ore in the shape of bullion and with it they can accept the proposal of

the banks and raise operating expenses at least.

Bullion shipments have already been resumed at the normal rates. The O'Brien mine made a small shipment and when it is learned what the quotation of the London prices means in cash there will probably be a general resumption. The Nipissing has made arrangements for the handling of theirs in New York and is sending bars to New York instead of London. Unless some very untoward incidents occur there now is no likelihood that more mines will close down and a probability that some of the men already laid off may be taken on again before the end of the month.

**Cariboo Cobalt.**—Owing to the fact that the Kerr Lake mine has closed down, the contract with the Dominion Reduction company for the treatment of their low grade ore fell through. The Cariboo Cobalt, which has never been able to get the tonnage wished treated, will profit by this and immediately raise their daily tonnage to the customs mill from 75 to 100 tons. The same company shipped 50,000 oz. of silver bullion to New York this week.

**Nipissing.**—The production from the Nipissing mine for the month of July was slightly higher than it has been for some months. The company mined ore of an estimated net value of \$211,596 and shipped bullion amounting to \$231,858.

The drift on the big vein at the 900-ft. level of shaft 64 showed a little more encouraging results. It has been drifted upon for 145 ft. and the most favorable portion of the vein shows about 2-ft. wide and with assays running from 12 to 14 oz. There is no intention of attempting to develop ore on this level but a winze will be sunk two or three hundred feet more with the hope that the vein may still continue to improve. Another important development is that one of the branch veins of 73 has been encountered on the other side of the fault and it is still showing good ore. The other branch veins are now expected to follow suit thus making an extension of orebodies of considerable importance. The 86 shaft on the shore of Cart Lake near the Gould has been closed down. Crosscuts at 150-ft. in the conglomerate on the other side of the lake near the McKinley boundary show no definite results.

## NOVA SCOTIA

**Dominion Coal Outputs.**—As forecasted in my previous letter the August output of the Dominion Company shows a falling off. At the time of writing it appears that the August production from the Glace Bay mine will be in the neighborhood of 385,000 tons compared with 399,458 tons obtained in August 1913. For the first eight months of 1914 the aggregate output from the Glace Bay Mines will amount to about 3,015,000 tons compared with 3,120,175 tons in the same period of last year. The Springhill outputs show an appreciable increase over last year's figures, and for the eight months ending August 31st the Springhill production will reach 271,000 tons compared with 256,000 tons in the corresponding period of 1913. To the end of August therefore the combined outputs of the mines of the Dominion Company will show a reduction of about 90,000 tons in output when compared with last year. Under the circumstances this must be regarded as a very favorable showing.

The drastic curtailment of operations at the works of the Dominion Iron & Steel Co., will of course have its effect upon the production of the mines. In the Summer of 1913 the Steel Company were operating five blast



furnaces, but at the present time one blast furnace only is working, and immediate prospects for the steel trade are not good.

The Nova Scotia Steel Company have made large reductions in their operations both at Sydney Mines and at New Glasgow, and it is understood they have laid off the blast furnace at Sydney Mines, thereby of course involving a considerable reduction in coal production.

At the other Nova Scotian collieries only partial time is being worked, and the Springhill Mines appear to be the only collieries on the mainland that are in full operation.

During the week ending 22nd August the Dominion Coal Company expect to despatch almost 100,000 tons of coal to the St. Lawrence markets. This is a pregnant fact seeing that the Empire is at war with a nation that boasts the second most powerful navy in the World. Some very foolish reports have been disseminated at points west of Glace Bay of hostile aeroplanes and German cruisers shelling Glace Bay, and of "German spies" attacking the wireless stations near here, and if the reports in the newspapers regarding happenings in other parts of Canada have no more foundation than the newspaper reports about Sydney and Glace Bay, readers are being served with a beautiful array of lies. It says a good deal for the sound common-sense of the mining community here that they have not allowed themselves to be stampeded by the baseless rumors which have been assiduously disseminated; and that they have served their country in probably the best possible way by sticking to work and earning money against the lean months which are ahead. The Dominion Coal Company has had the honor of being able to coal several of the warships of the Admiralty which have made Halifax their rendezvous, and generally we have realized the silent, invisible but all-encircling power of Britain's Navy, which has enabled us to mine and ship coal unmolested as in the piping times of peace.

As to the immediate future of the coal trade in Nova Scotia it is, like everything else at the moment, on the knees of the Gods. Coal, however, is one of those commodities which must be had, and while, of course, the coal trade must be affected by the suspension of many branches of transportation and industry which will accompany the continuance of the war, there is no reason to anticipate that the coal industry will be affected out of proportion to other branches of industry in Canada, and it is reasonable to suppose that it will fare better than many other industries. It is hardly necessary to point out that in certain contingencies, which it is hoped will not arise, the coalfields of Nova Scotia would be the only available coal supply for Canada east of the Great Lakes.

## BRITISH COLUMBIA

In British Columbia, as elsewhere, one of the results of the European war is the partial suspension of mining and smelting operations. To what farther extent mineral production and development of mining properties will be unfavorably affected is not yet known, but it may be expected under the circumstances that metals cannot for the time be marketed, and some of them may not be exported even if a market be soon open to them, that most of the mines having as their chief product copper, lead or zinc, will be closed temporarily. Already the Granby Consolidated Co.'s smelting works in Boundary district are inoperative, and, as a consequence, shipment of ore from the company's big mines in Phoenix camp has been stopped for

the time being. The British Columbia Copper Co.'s smeltery at Greenwood is also to be idle for a while, with no present prospect of an early resumption of ore smelting at it even should relief from adverse conditions attributable to the war be obtained. What will happen at the Consolidated Mining and Smelting Co.'s works at Trail seems to be as yet uncertain, except that little, if any, custom ore will be purchased until conditions become once more favorable to a continuance of the custom smelting business. It is thought probable that the company will continue operating its gold-copper mines in Rossland camp, since the chief valuable metal constituent of Rossland ores is gold, the proportion of which is indicated by the following official figures of last year's production. The total value of the metals produced in Trail Creek mining division in 1913 was \$3,281,771, of which \$2,831,873, or a little more than 86 per cent, was for gold. However, as the recovery of metals is by smelting in the blast furnace, it may be that there are difficulties in the way of having the matte converted and the gold-copper bullion refined. The position is different at other mines the company is operating; for instance, the valuable metal contents of ore from the Silver King mine, near Nelson, are copper and silver; of that from the Sullivan Group mine, in East Kootenay, lead with a little silver; of that from the No. 1 and Highland mines, in Ainsworth camp, silver and lead. This being so, it is hardly to be expected that production of ore on as large a scale when conditions are normal will be continued. Turning to the coal mines of East Kootenay—since the temporary cessation of smelting operations at Boundary district smelting works reduces considerably the demand for coke, it is evident that the mines of the Crow's Nest Pass Coal Co. at Coal creek and Michel will be affected thereby. There is a large proportion of slack in the coal mined at these places, and practically all of this is made into coke. With coke requirements comparatively small, the production of such coal as is mined in greater part at the Crow's Nest Pass Coal Co.'s mines, is likely to be seriously checked. Even if the demand for screened coal be good, storage facilities for slack are not sufficient to admit of the accumulation of so large a quantity as would result from continuing production at the usual rate. So it may be expected that the Coal Creek and Michel mines will make a smaller output during the period of total or partial suspension of smelting operations. The Corbin Coal and Coke Co. will probably continue to make an output of approximately 500 tons of coal a day, for coke making has not yet been undertaken by this company, nor is the market it usually has for its coal likely to be closed to it by war troubles. However, the foregoing notes are but the conclusions of the writer; it may be that conditions of which he is not aware will bring about different results to those he has indicated.

### East Kootenay.

The probable effect of recent occurrences on mining in this district is outlined above. There being but one metalliferous mine—the Sullivan—that has been making an important output of late, the ill-effects of the metal marketing difficulty will be felt chiefly in the locality in which that mine is situated, although, of course, train crews will be affected here if shipment of ore be stopped, though in much smaller degree than in connection with that of coal and coke. Interest in placer-gold mining in Fort Steele mining division having been in some measure renewed lately, it may be that more attention will be given to this branch of the



industry, and this notwithstanding that it is late in the season to carry on placer operations. There are several streams in the division long known as gold bearing, and some of which have been producers to an important extent. Men have been prospecting these and reports have been published making it appear that there is promise of more placer gold being recovered than for a number of years. Meanwhile construction of the Kootenay Central Railway is being advanced, and the provision of improved transportation facilities is promised for the near future.

#### West Kootenay.

**Ainsworth.**—The Kaslo "Kootenayan," in the course of a review of the effects of the war in the district, makes the following comment: "The shutting down of some mining properties and the threat of a general close-up is the worst feature of the local outlook. The inability of the owners of the Trail smelter to take custom ores is the cause of this condition, but as the smelter officials do not know where the world's metal markets stand under the circumstances, have no alternative. In case of a general shutdown, the only mining properties that will be working in this neighborhood, will be those engaged in development work, of which, however, there will be quite a number, so that things are really not so black from an industrial standpoint as many try to make out. The biggest shut down so far is that of the Bluebell lead mine and concentrator, which stopped work early in August. About the same time several Slovan properties were either closed or reduced their working forces. In Ainsworth division, one shift of men was laid off at the No. 1 mine, while at the Maestro orders were received to fill the ore bunkers before ceasing operations. At the Utica six men have been retained."

**Nelson.**—Mention has already been made of the Consolidated Co.'s Silver King mine. It is not yet made public how this mine will be affected by the changed conditions, but it is hoped development work will be continued even if it be found necessary to suspend shipment of ore. The same company's Molly Gibson silver-lead mine, also in Nelson division, is similarly situated as regards its ore product, for this cannot now be turned to profitable account, but it may be development work will be continued until the time for the usual winter suspension of work. Several small gold mines in the neighborhood of the town of Nelson are being developed; the question of finances will be the one to determine whether or not work shall be continued under existing conditions. In Ymir camp, too, development work has been in progress, with no recent production of ore. About Salmo, three lead producing properties will be affected. At Sheep creek and Erie gold mines are being operated; at least two of these may be expected to continue in operation, and each has its own stamp mill with which to recover much of the gold in the ore mined.

**Rossland.**—The mines that have been operated in this camp with little or no intermission during recent years are the Centre Star-War Eagle group and the Le Roi-Black Bear group, both owned by the Consolidated Mining and Smelting Co., and the Josie group of the Le Roi No. 2, Ltd. An idea of the productiveness of these mines may be obtained from the following figures, showing the weekly tonnage of ore received from them at the Trail smelter: Week ended July 9, 5,970 tons; July 16, 3,386 tons; July 23, 2,706 tons; July 30, 5,399 tons; August 6, 7,078 tons; August 13, 6,288 tons; total for six weeks, 30,836 tons. This gives

an average output of more than 5,000 tons a week. The total of receipts at Trail from Rossland mines does not include second-class ore milled at the Le Roi No. 2 Co.'s concentrator, but only the much smaller quantity of concentrate produced.

#### Boundary.

With the copper mines of the British Columbia Copper Co. and the Granby Consolidated Co. idle, there will be very little mining going on in Greenwood and Grand Forks mining divisions. As the Union mine, up the north fork of Kettle river, and two or three properties up the west fork of the same river, were shipping ore to one or other of the smelters that have been taking custom ore, it is unlikely that it will be found practicable to continue at work under the altered conditions. The Jewel gold mine, near Greenwood, may be able to keep going, for its product is gold bullion recovered by stamp milling and cyaniding, but this will be determined by the question of whether or not requisite supplies shall be obtainable.

In Similkameen district, the Hedley Gold Mining Co. will doubtless endeavor to keep its 40-stamp mill and cyanide plant going as usual. The value of its output last year was about \$67,000 a month. No figures are at hand to show this year's results, but probably they have averaged rather higher per month. Placer gold mining on a small scale and a little coal mining are being done; outside of these, the most important operations are those of the British Columbia Copper Co. on Copper mountain, within a dozen miles of Princeton, where development of a large group of copper claims has been in progress for about two years.

#### Coast District.

**Vancouver Island.**—The demand for Vancouver Island coal was greater in August than at any previous time since the loss of the chief market following the interruption in production caused by the strike last year of the miners and other coal mine employees. About the middle of August the approximate output of the Canadian Collieries (Dunsmuir), Ltd., was 2,400 tons a day from mines in Comox district, and 400 tons a day from those at Extension. There was then a demand for at least one-third more than was being produced at the mines mentioned. The Western Fuel Co., the Pacific Coast Coal Mines, Ltd., and the Vancouver-Nanaimo Coal Mining Co., all operating in the Nanaimo District, have also been working latterly to present full capacity.

#### CANADIAN MINING INSTITUTE.

The Canadian Mining Institute has issued a new printed "List of Officers, Members, Associate Members and Student Members," as at July 1, 1914, to take the place of that previously issued as at November 1, 1912. The geographical distribution of members shows the following proportions in Canada (exclusive of members of affiliated mining societies): New Brunswick 3, Nova Scotia 22, Quebec 124, Ontario 372, Manitoba 6, Saskatchewan 3, Alberta 91, British Columbia 173, Yukon 2. In addition there are numerous members resident out of Canada, including 115 in the United States. It is noteworthy that of 26 members of the Council of the Institute, Ontario has 11, or about one for every 34 of its Institute members; Quebec 9, or one for every 14 members; Alberta 2, or one for every 45 members; British Columbia 2, or one for every 87 members; and Nova Scotia 1 for its 22 members. Quebec and British Columbia had, respectively, 10 and 3 representatives in the Council, but by the death of Dr. A. E. Barlow and Mr. W. J. Sutton, each of these provinces lost a representative.

## MARKETS

## TORONTO MARKETS.

Aug. 26—(Quotations from Canada Metal Co., Toronto).

Spelter, 6 cents per lb.  
 Lead, 5 cents per lb.  
 Tin, 60 cents per lb.  
 Antimony, 23 cents per lb.  
 Copper, casting, 14¼ cents per lb.  
 Electrolytic, 14¾ cents per lb.  
 Ingot brass, yellow, 10; red, 13 cents per lb.

Aug. 26—Coal—(Quotations from Elias Rogers Co., Toronto).

Anthracite, \$7.75 per ton.  
 Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Aug. 24—Connellsville coke, (f.o.b. ovens).

Furnace coke, prompt, \$1.75 per ton.  
 Foundry coke, prompt, \$2.25 to \$2.35 per ton.

Aug. 24—Tin, straits, 40.00 cents.

Copper, Prime lake, 12.50 to 12.75 cents.  
 Electrolytic copper, 12.25 to 12.37½ cents.  
 Copper wire, 13.75 to 14.00 cents.  
 Lead, 3.90 cents.  
 Spelter, nominal, 6.00 to 6.12½ cents.  
 Sheet zinc (f.o.b. smelter), 7.50 to 8.00 cents.  
 Antimony, Cookson's, 16.00 to 16.50 cents.  
 Aluminum, 20.00 to 21.00 cents.  
 Nickel, 40.00 to 45.00 cents.  
 Platinum, nominal, \$50.00 to \$52.00 per ounce.  
 Bismuth, nominal, \$2.25 to \$3.00 per pound.  
 Quicksilver, \$75.00 to \$90.00 per 75-lb. flask.

## SILVER PRICES.

	New York	London
	cents.	pence.
Aug. 7. . . . .	*	†26
" 8. . . . .	*	†27
" 10. . . . .	*	†27¾
" 11. . . . .	*	†26½
" 12. . . . .	*	†26½
" 13. . . . .	*	†26½
" 14. . . . .	*	†27
" 15. . . . .	*	†27
" 17. . . . .	†57 -59	†27¼
" 18. . . . .	†56½-58½	†26½
" 19. . . . .	†56 -58	†26½
" 20. . . . .	†55¾-57¾	†26½
" 21. . . . .	†55 -57	26
" 22. . . . .	56	25½
" 24. . . . .	55¾	

\*—No market. †—Nominal. ‡—Unofficial.

## TORONTO MINING STOCKS.

August 24, 1914.

With the presumed idea of accommodating those who wished to sell for cash, and buyers who wished to pick up cash bargains, the Toronto Standard Stock and Mining Exchange, Limited, resumed operations this morning, following the temporary closure on July 28. The experiment is considered entirely successful.

The conditions of trading, which were agreed upon last week, consist of daily morning sessions only, exclusive cash transactions and minimum prices fixed by the Exchange; the daily sessions to be from 10 a.m. to 12.30 p.m.

There was no untoward excitement at the opening. Only the active stocks were placed on the board, and, at the commencement, less than a dozen secured attention.

The total sales of the session amounted to 21,772, against sales of 38,225 on the closing day of July 28.

Among the stocks which brought prices above the minimum were the following:

Crown Reserve, 10 points; McKinley, 5 points; Peterson Lake, ½ point; Temiskaming, 1 point; Nipissing, 50 points, and Hollinger, 50 points.

The minimum scale fixed by the Exchange, and below which no sales are permitted, is as follows:

## —Cobalts—

Beaver. . . . .	.17
Buffalo. . . . .	.75
Chambers Ferland . . . . .	.10
Canadian. . . . .	.05
City of Cobalt . . . . .	.30
Cobalt Lake . . . . .	.30
Coniagas. . . . .	6.00
Crown Reserve . . . . .	1.00
Great Northern . . . . .	.04
Hudson Bay . . . . .	30.00
Kerr Lake . . . . .	4.00
La Rose . . . . .	.70
McKinley Darragh . . . . .	.40
Nipissing. . . . .	4.75
Peterson Lake . . . . .	.23
Seneca Superior . . . . .	2.00
Temiskaming. . . . .	.07
Trethewey. . . . .	.12
Wettlaufer . . . . .	.04½
York, Ont. . . . .	.07

## Porcupines.

Dome Extension . . . . .	.05
Dome Lake . . . . .	.30
Dome Mines . . . . .	6.50
Foley O'Brien . . . . .	.20
Hollinger . . . . .	16.00
Homestake M. F. . . . .	.20
Jupiter . . . . .	.04
McIntyre . . . . .	.27
Pearl Lake . . . . .	.02
Porcupine Crown . . . . .	.75
Porcupine Peterson . . . . .	.25
Porcupine Vipond . . . . .	.17
Rea Consolidated . . . . .	.10
Teck Hughes . . . . .	.07
West Dome . . . . .	.05



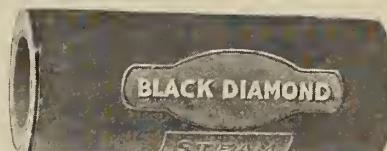
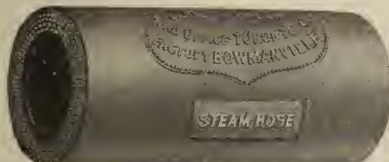


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Goodyear Steam Hose also has an oil resisting tube. This hose has been tested for 1446 hours at 100 pounds steam pressure with oil injected, without being affected by the oil in any

way. This hose also comes wire wound. This gives it long life under rough and continuous handling. The wire winding protects and keeps the hose intact even under severe abuse.

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# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

<b>Dominion of Canada. Ontario</b> Astley, J. W. Cohen, S. W. Campbell & Deyell. Carter, W. E. H. Evans, J. W. Ferrier, W. F. Forbes, D. L. H. Graham, S. N.	Gwillim, J. C. Handley, John. Hassan, A. A. Haultain, H. E. T. Hille, F. Loring, F. C. McEvoy, Jas. Scott, G. S. Segsworth, Walter E. Smith, Alex H.	Smith, Sydney. Maurice W. Summerhayes. Tyrrell, J. B.  <b>Quebec</b> Burchell, Geo. B. Cohen, S. W. DePencier, H. P. Hardman, J. E. Hersey, Milton L. Johnson, W. S.	Smith, W. H. Ross, J. G. <b>British Columbia</b> Brown & Butters. Fowler, S. S. <b>FOREIGN-New York</b> Canadian Mining & Exploration Co., Ltd. Colvocoresses, Geo. M. Dorr, Jno. V.N. Hassan, A. A.
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## ASSAYERS, CHEMISTS AND ORE TESTERS.

<b>Dominion of Canada Ontario</b> Belleville Assay Office. Campbell & Deyell Heys, Thos. & Son	Canadian Laboratories, Ltd.  <b>Quebec</b> Hersey, Milton Co., Ltd	Dr. J. T. Donald	<b>Foreign-New York</b> Ledoux & Co.
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## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

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<b>BROWN &amp; BUTTERS</b> Mining Geologists and Metallurgical Engineers PRINCE RUPERT, B.C.	<b>COHEN, SAMUEL W., E. M.</b> Consulting Engineer, Room 601, Dom. Express Bldg. Montrea General Manager, Crown Reserve Mining Co. Ltd. Cobalt, Can.	<b>FOWLER, S. S.</b> Mining Engineer, NELSON, B. C.
<b>BURCHELL, GEO. B.</b> Mining Engineer Lignite and Bituminous Coal Mining Examinations and Reports 505 MCGILL BLDG., MONTREAL Cable Address "Minchel" Phone Main 6737	<b>Colvocoresses, George M.,</b> Mining Engineer 43 Exchange Place - New York City General Manager Consolidated Arizona Smelting Co., Humboldt, Ariz.	<b>FORBES, D. L. H.</b> Mining & Metallurgical Engineer Chuquicamata, Chile Chief Construction Engineer for Chile Copper Co.
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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

#### REPORTS RECENTLY ISSUED:

##### CANADA

1240. Victoria Memorial Museum Bulletin No. 1. Contains short scientific papers.

##### NEW BRUNSWICK and NOVA SCOTIA

- Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.  
Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

##### QUEBEC

- Memoir 43. St. Hilaire (Beloeil) and Rougemont mountains, Quebec, by J. J. O'Neill.

##### ONTARIO

- Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

##### NORTH-WEST PROVINCES

- Memoir 30. The basins of Nelson and Churchill rivers, by William McInnes. Map not published.  
Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

##### BRITISH COLUMBIA

- Memoir 23. Geology of the coast and islands between the Strait of Georgia and Queen Charlotte Sound, B.C., by J. Austen Bancroft.  
Memoir 36. Geology of the Victoria and Saanich Map areas, Vancouver Island, B.C., by Chas. H. Clapp. Maps not published.

##### YUKON AND NORTH-WEST TERRITORIES

- Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

#### MAPS RECENTLY ISSUED:

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- Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

##### NEW BRUNSWICK AND NOVA SCOTIA

- Map 26A. Bathurst and vicinity, Gloucester County, New Brunswick. Topography.  
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- Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

**NOTE.**—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

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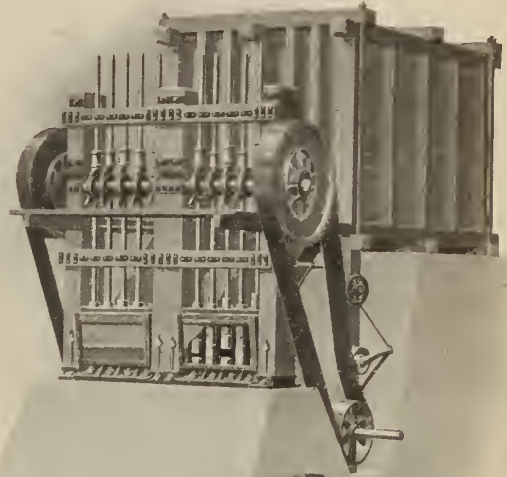
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## Amalgamators—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Northern Canada Supply Co.

## Assayers and Chemists—

Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York

Thos. Heys & Son.

## Assayers' and Chemists' Supplies—

C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lymans, Ltd., Montreal, Que.  
Stanley, W. F. & Co., Ltd.  
Peacock Bros.

Geo. Taylor Hardware Co., Ltd.

## Bags—

Smart-Woods, Ltd.

## Ball Mills—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.

Mussens, Ltd.

Krupp, Fried. A. G., Germany

The John Inglis Co., Ltd.

## Beams—Steel—

Canadian Allis-Chalmers, Ltd.

Dominion Bridge Co.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

## Belt—

Canadian Allis-Chalmers, Ltd.

Mussens, Ltd.

Northern Canada Supply Co.

Jones & Glassco

Canadian Fairbanks-Morse

Federal Engineering Co.,

G. Taylor Hardware Co., Ltd.

## Blasting Batteries and Supplies—

Canadian Allis-Chalmers, Ltd.

Thomas & William Smith

Can. Ingersoll-Rand Co., Ltd.

Curtis & Harvey (Canada),

Limited.

Mussens, Ltd.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.

## Blowers—

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.

## Boilers—

Jenckes Machine Co., Ltd.

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Waterous Engine Works Co.,

Canadian Fairbanks-Morse

Co., Ltd.

Peacock Bros.

Northern Canada Supply Co.

Can. Ingersoll-Rand Co., Ltd.

The John Inglis Co., Ltd.

## Buckets—

Rock & Power Mach'y, Ltd.

Hendrick Mfg. Co.

M. Beatty & Sons, Ltd.

Waterous Engine Works.

Mussens, Ltd.

Northern Canada Supply Co.

## Buildings—Steel Frame—

Dominion Bridge Co.

Canadian Allis-Chalmers, Ltd.

## Cable — Aerial and Under-ground—

G. Taylor Hardware Co., Ltd.

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Northern Canada Supply Co.

## Cableways—

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

M. Beatty & Sons, Ltd.

Mussens, Ltd.

## Cages—

Rock & Power Mach'y, Ltd.

Fraser & Chalmers, Ltd.

Jeffrey Mfg. Co.

Northern Canada Supply Co.

Jenckes Machine Co., Ltd.

## Cables—Wire—

Northern Electric Co., Ltd.

Standard Underground Cable

Co. of Canada, Ltd.

Siemens Co. of Canada, Ltd.

## Cannons—

Smart-Woods, Ltd.

G. Taylor Hardware Co., Ltd.

## Carbon (Black Diamonds and Bortz)—

Abe. Levine

## Cars—

Jeffrey Mfg. Co.

Mussens, Ltd.

Northern Canada Supply Co.

## Cement Machinery—

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Krupp, Fried. A. G., Germany

Jenckes Machine Co., Ltd.

Northern Canada Supply Co.

Peacock Bros.

## Chains—

Jeffrey Mfg. Co.

Peacock Bros.

Jones & Glassco

Mussens, Ltd.

Canadian Fairbanks-Morse

Co.

B. Greening Wire Co., Ltd.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.

## Chain Blocks—

The Herbert Morris Crane & Hoist Co., Ltd.

## Chemists—

Canadian Laboratories.

Campbell & Deyell

Thos. Heys & Son

Milton Hersey Co.

Ledoux & Co.

## Coal—

Dominion Coal Co.

Nova Scotia Steel & Coal Co.

## Coal Cutters—

Canadian Allis-Chalmers, Ltd.

Jeffrey Mfg. Co.

Sullivan Machinery Co.

Can. Ingersoll-Rand Co., Ltd.

Peacock Bros.

Mussens, Ltd.

## Coal Handling Machinery—

Rock & Power Mach'y, Ltd.

The Herbert Morris Crane & Hoist Co., Ltd.

## Coal Mining Explosives—

Curtis & Harvey (Can.), Ltd.

## Coal Mining Machinery—

Rock & Power Mach'y, Ltd.

Can. Ingersoll-Rand Co., Ltd.

Fraser & Chalmers, Ltd.

Peacock Bros.

Jeffrey Mfg. Co.

## Coal Puncturers—

Sullivan Machinery Co.

Can. Ingersoll-Rand Co., Ltd.

## Coal Washeries—

Jeffrey Mfg. Co.

Mussens, Ltd.

Peacock Bros.

## Compressors—Air—

Jenckes Machine Co., Ltd.

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Sullivan Machinery Co.

Canadian Allis-Chalmers, Ltd.

Laurie & Lamb

Canadian Westinghouse

Can. Ingersoll-Rand Co., Ltd.

Cleveland Pneumatic Tool

Co. of Canada, Ltd.

Mussens, Ltd.

Peacock Bros.

Northern Canada Supply Co.

The John Inglis Co., Ltd.

## Concentrators and Jigs—

Rock & Power Mach'y, Ltd.

Fraser & Chalmers, Ltd.

James Ore Concentrator Co.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

Canadian Fairbanks-Morse

Jenckes Machine Co., Ltd.

## Concrete Mixers—

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Peacock Bros.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.

## Condensers—

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Smart-Turner Machine Co.

Peacock Bros.

Laurie & Lamb

Northern Canada Supply Co.

The John Inglis Co., Ltd.

## Converters—

Canadian Westinghouse

Fraser & Chalmers, Ltd.

Jeffrey Mfg. Co.

Northern Canada Supply Co.

Jenckes Machine Co., Ltd.

Peacock Bros.

Krupp, Fried. A. G., Germany

Mussens, Ltd.

Waterous Engine Works

Conveying Machinery—

Rock & Power Mach'y, Ltd.

The Herbert Morris Crane & Hoist Co., Ltd.

## Conveyor—Trough—

Hendrick Mfg. Co.

## Cranes—

Rock & Power Mach'y, Ltd.

Smart-Turner Machine Co.

Peacock Bros.

Mussens, Ltd.

Canadian Fairbanks-Morse

Co., Ltd.

M. Beatty & Sons, Ltd.

Krupp, Fried. A. G., Germany

## Cranes—Electric—

The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—Overhead Traveling—

Rock & Power Mach'y, Ltd.

The Herbert Morris Crane & Hoist Co., Ltd.

## Crane Ropes—

Allan, Whyte & Co.

Thos. & Wm. Smith

B. Greening Wire Co., Ltd.

G. Taylor Hardware Co., Ltd.

## Cranes—Swing Jib—

The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—Wall—

The Herbert Morris Crane & Hoist Co., Ltd.

## Crushers—

Jenckes Machine Co., Ltd.

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Fraser & Chalmers, Ltd.

Krupp, Fried. A. G., Germany

Peacock Bros.

Lymans, Ltd.

Can. Fairbanks-Morse Co.

Mussens, Ltd.

Hadfield's Steel Foundry Co.

## Cyanide Plants—

Jenckes Machine Co., Ltd.

Fraser & Chalmers, Ltd.

Krupp, Fried. A. G., Germany

Roessler & Hasslacher

Thos. & Wm. Smith

Peacock Bros.

## Derricks—

Rock & Power Mach'y, Ltd.

Smart-Turner Machine Co.

S. Flory Mfg. Co.

M. Beatty & Sons, Ltd.

Mussens, Ltd.

## Diamonds (for Diamond Drills)—

Abe. Levine

## Diamond Drill Contractors—

Diamond Drill Contracting

Co.

Smith & Travers.

## Dredging Machinery—

Canadian Allis-Chalmers, Ltd.

Peacock Bros.

M. Beatty & Sons.

Mussens, Ltd.

## Dredging Ropes—

Allan, Whyte & Co.

Fraser & Chalmers, Ltd.

B. Greening Wire Co., Ltd.

## Drills, Air and Hammer—

Jenckes Machine Co., Ltd.

Rock & Power Mach'y, Ltd.

Canadian Allis-Chalmers, Ltd.

Can. Ingersoll-Rand Co., Ltd.

Mussens, Ltd.

Jeffrey Mfg. Co.

Sullivan Machinery Co.

Peacock Bros.

Northern Canada Supply Co.

G. Taylor Hardware Co., Ltd.



# Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.  
Main Western Office - VICTORIA, B.C.

This stamp



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Get this stamp on your explosives and you get efficiency.

See us before buying elsewhere.

We specialize in explosives for safe coal getting and rock work.

We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

We also handle the best of blasting accessories, including Electric Fuses, Electric Time Fuses, Safety Fuse, Blasting Batteries, Tamping Bags, Thawing Cans, Connecting Wire and Leading Wire, in fact everything needed for your work.

Our Stumping Powder has made land clearing cheap and easy for the farmer.

We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

## DISTRICT OFFICES:

NOVA SCOTIA :	-	-	-	-	-	-	Halifax
QUEBEC :	-	-	-	-	-	-	Montreal
ONTARIO :	Toronto,	Cobalt,	South Porcupine,	Port Arthur,			Kingston
MANITOBA :	-	-	-	-	-	-	Winnipeg
ALBERTA :	-	-	-	-	-	-	Edmonton
BRITISH COLUMBIA :	Vancouver,	Victoria,	Nelson,				Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 32.)

**Furnaces—Assay—**

Krupp, Fried. A. G., Germany  
Lymans, Ltd.  
Mussens, Ltd.

**Fuse—**

Peacock Bros.  
Curtis & Harvey, (Canada),  
Limited  
Canadian Westinghouse  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

**Gears—**

Canadian Westinghouse  
Krupp, Fried. A. G., Germany  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

**Generators—**

Canadian Westinghouse  
Northern Electric Co., Ltd.  
Peacock Bros.

Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.

**Hangers—Cable—**

Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.

**Hand Hoists—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Heaters—Feed Water—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Laurie & Lamb  
Canadian Westinghouse  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
G. Taylor Hardware Co., Ltd.

**High Speed Steel Twist Drills—**

Mussens, Ltd.  
Northern Canada Supply Co.

**Hoists—Air Electric and**

**Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glasco  
Waterous Engine Works  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Siemens Co. of Canada, Ltd.

**Hoists, Chain, Electric and**

**Pneumatic—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Hoisting and Conveying Mach-**

**inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.

**Hoisting Engines—**

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Siemens Co. of Canada, Ltd.  
Sullivan Machinery Co.  
Fraser & Chalmers, Ltd.  
Can. Ingersoll-Rand Co.

**Hoists—Gas and Gasoline—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Waterous Engine Works.

**Hose—**

H. W. Johns-Manville Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Cleveland Drill Co.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

**Jacks—**

Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

**Jigs—**

Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.

**Lamps—Acetylene—**

Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Northern Canada Supply Co.

**Lamps—Safety—**

Canadian Explosives  
Peacock Bros.  
Ackroyd & Best  
Siemens Co. of Canada, Ltd.

**Link Belt—**

Waterous Engine Works  
Northern Canada Supply Co.  
Jones & Glasco

**Locomotives—Electric—**

Jeffrey Mfg. Co.  
Canadian Westinghouse  
Siemens Co. of Canada, Ltd.

**Locomotives—Steam—**

Mussens, Ltd.  
Canadian Westinghouse

**Metal Merchants—**

Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.

**Monel Metal—**

Orford Copper Co.

**Motors—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
G. Taylor Hardware Co., Ltd.  
Canadian Westinghouse  
Peacock Bros.  
Siemens Co. of Canada, Ltd.

**Ore Sacks—**

Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.

**Ore Testing Works—**

Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.

**Ores and Metals—Buyers and**

**Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Krupp, Fried. A. G., Germany  
Orford Copper Co.  
Canada Metal Co.

**Perforated Metals—**

B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.

**Pick Machines—**

Sullivan Machinery Co.

**Picks—Steel—**

Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Thos. & Wm. Smith  
Peacock Bros.

**Pipes—**

Consolidated M. & S. Co.  
Peacock Bros.  
G. Taylor Hardware Co., Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.

**Pipe Fittings—**

Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Canadian Westinghouse  
Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.

**Pneumatic Chain Blocks—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Pneumatic Tools—**

Can. Cleveland Drill Co.  
Can. Ingersoll-Rand Co., Ltd.  
G. Taylor Hardware Co., Ltd.  
Jones & Glasco

**Producer—Gas—**

Krupp, Fried. A. G., Germany  
Mussens, Ltd.

**Prospecting Mills and Machin-**

**ery—**  
Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hang-**

**ings—**  
G. Taylor Hardware Co., Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

**Pumps—Boiler Feed—**

Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.

**Fraser & Chalmers, Ltd.****Pumps—Centrifugal—**

Rock & Power Mach'y, Ltd.  
G. Taylor Hardware Co., Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Thos. & Wm. Smith  
M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.  
Laurie & Lamb  
Fraser & Chalmers, Ltd.

**Pumps—Electric—**

Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.  
Siemens Co. of Canada, Ltd.

**Pumps—Pneumatic—**

Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

**Pumps—Steam—**

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
G. Taylor Hardware Co., Ltd.  
The John Inglis Co., Ltd.

**Pumps—Turbine—**

Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.

**Pumps—Vacuum—**

Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.

**Quarrying Machinery—**

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Krupp, Fried. A. G., Germany  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.

**Rails—Mine—**

H. A. Drury Co., Ltd.

**Roasting Plants—**

Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Krupp, Fried. A. G., Germany

**Rolling Mill Machinery—**

Krupp, Fried. A. G., Germany

**Rolls—Crushing—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.  
Can. Allis-Chalmers, Ltd.

**Roofing—**

Paterson Mfg. Co.  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville  
Geo. Taylor Hardware Co., Ltd.

**Rope Blocks—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Rope—Manilla and Jute—**

Jones & Glasco  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**

B. Greening Wire Co.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith  
Fraser & Chalmers, Ltd.

**Rubber—**

Canadian Consolidated Rub-  
ber Co., Ltd.  
G. Taylor Hardware Co., Ltd.

**Runways, Hand Operated—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Samplers—**

Canadian Laboratories  
Ledoux & Co.  
Milton Hersey Co.  
Krupp, Fried. A. G., Germany  
Thos. Heys & Son

**Screens—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
R. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Waterous Engine Co.  
Fraser & Chalmers, Ltd.  
Jenckes Machine Co., Ltd.

**Separators—**

Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Smart-Turner Machine Co.  
Peacock Bros.

**Separators—Magnetic—**

Krupp, Fried. A. G., Germany

**Shear Legs—**

The Herbert Morris Crane &  
Hoist Co., Ltd.

**Shovels—Steam—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
M. Beatty & Sons

**Slime Tables—**

Deister Concentrator Co.  
James Ore Concentrator  
Can. Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany

**Smelting Machinery—**

Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**Stamp Mills—**

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Krupp, Fried. A. G., Germany  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**Steel Drills—**

Rock & Power Mach'y, Ltd.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Krupp, Fried. A. G., Germany  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Swedish Steel & Imp. Co., Ltd.  
G. Taylor Hardware Co., Ltd.

**Steel—Tool—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Can. Fairbanks-Morse Co.  
Krupp, Fried. A. G., Germany  
N. S. Steel & Coal Co.  
Swedish Steel & Imp. Co., Ltd.

**Surveying Instruments—**

Peacock Bros.  
W. F. Stanley  
C. L. Berger

**Switchboards—**

Canadian Westinghouse  
Can. Allis-Chalmers, Ltd.  
Northern Electric Co., Ltd.  
Siemens Co. of Canada, Ltd.

**Tanks—Cyanide, Etc.—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
Jenckes Machine Co., Ltd.

**Tramways—**

Mussens, Ltd.  
B. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.

**Transformers—**

Canadian Westinghouse  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Peacock Bros.  
Siemens Co. of Canada, Ltd.

**Transits—**

C. L. Berger & Sons  
Peacock Bros.

**Tractors—Oil—**

Can. Fairbanks-Morse Co.

**Tube Mills—**

Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Krupp, Fried. A. G., Germany  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**Turbines—**

Rock & Power Mach'y, Ltd.  
Canadian Westinghouse  
Peacock Bros.  
Laurie & Lamb  
Can. Allis-Chalmers, Ltd.  
Siemens Co. of Canada, Ltd.  
Krupp, Fried. A. G., Germany  
Fraser & Chalmers, Ltd.

**Water Wheels—**

Can. Allis-Chalmers, Ltd.  
Krupp, Fried. A. G., Germany

**Winding Engines—**

Rock & Power Mach'y, Ltd.  
Waterous Engine Works  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.

**Siemens Co. of Canada, Ltd.****Wire Cloth—**

G. Taylor Hardware Co., Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
B. Greening Wire Co.

**Wire (Bare and Insulated)—**

Northern Electric Co., Ltd.  
Standard Underground Cable  
Co., of Canada, Ltd.

**Zinc Dust—**



# LEGG BROS

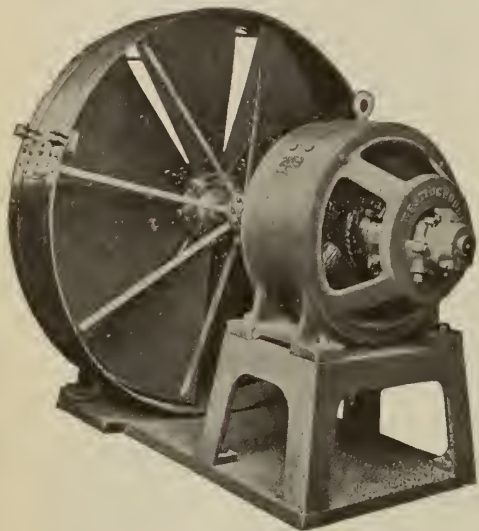
## ENGRAVING & CO.



DESIGNING & ENGRAVING  
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TORONTO CANADA



## Westinghouse Motors for Mine Ventilating Fans



Westinghouse Motor Driving Mine Fan

Mine ventilating fans driven by Westinghouse Motors operate with the absolute reliability essential to this class of service.

*Ask nearest office for particulars*

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*Two thousand square miles of railway lands in the Lake Superior region that have been held in reserve during the construction of the A. C. & H. B. Railway are now open for public prospecting.*

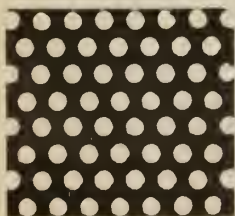
*No license is required; staking, recording and assessment work practically as on Government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. The lands are in alternate blocks with intervening areas of Government lands which are also open for prospecting. Two passenger trains daily through the district.*

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Manager, Lands Dept., A. C. & H. B. Ry.,

Sault Ste. Marie, Canada



## PERFORATED METALS

*For Every and All  
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Elevator Buckets (plain and perforated).  
Conveyor Flights and Trough, also  
General Sheet Iron Work.

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New York Office: 30 Church St.



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WIRE ROPE MANUFACTURERS,

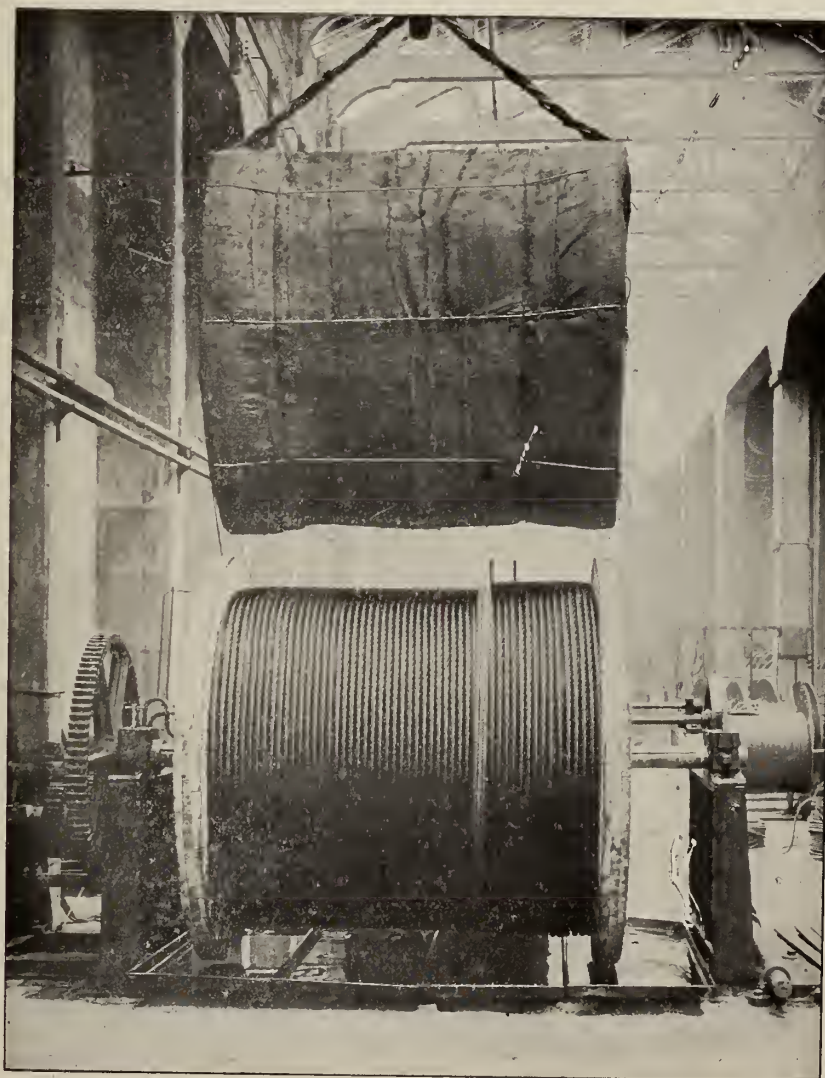
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**Best Quality Only**

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# ✂ CANADIAN ✂ MINING JOURNAL

VOL. XXXV

TORONTO

No. 18

## AT THE FRONT



## THE HARDY SIMPLEX HAMMER DRILL

FOR BORING SPEED

Recent Test ;

Hardy B7 Drilled 7 ft. 6 in. in 15 min.

Competitor Drilled 5 ft. 10 in. in 18 min.

Many Similar Victories to Our Credit

B6 For Ordinary Work

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*This Name on Pipe has never  
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for Fifty Years*

**T**HE name of Byers Genuine Wrought Iron Pipe is inseparably associated with highest pipe quality. It is as natural to think of Byers as the best pipe as it is to believe that one kind of pipe can be better than another.

Such distinction is never the result of chance; never undeserved. With Byers, it is due to the rigid maintenance of the Byers standard of quality; to the fact that the name Byers on pipe has invariably guaranteed genuineness; full weight; efficiency.

The Byers standards are in themselves higher than those of any other mill. It is notable that in three generations of recorded experience they have never altered; never lowered.

*How often have you heard:  
"It is as good as Byers"*

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ESTABLISHED 1864  
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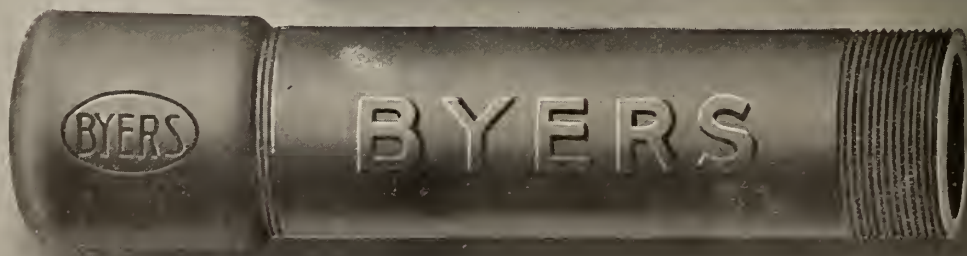
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*Write for the name of the Byers Dealer in your district. He can supply you immediately  
Look for the Byers mark on every length and coupling*

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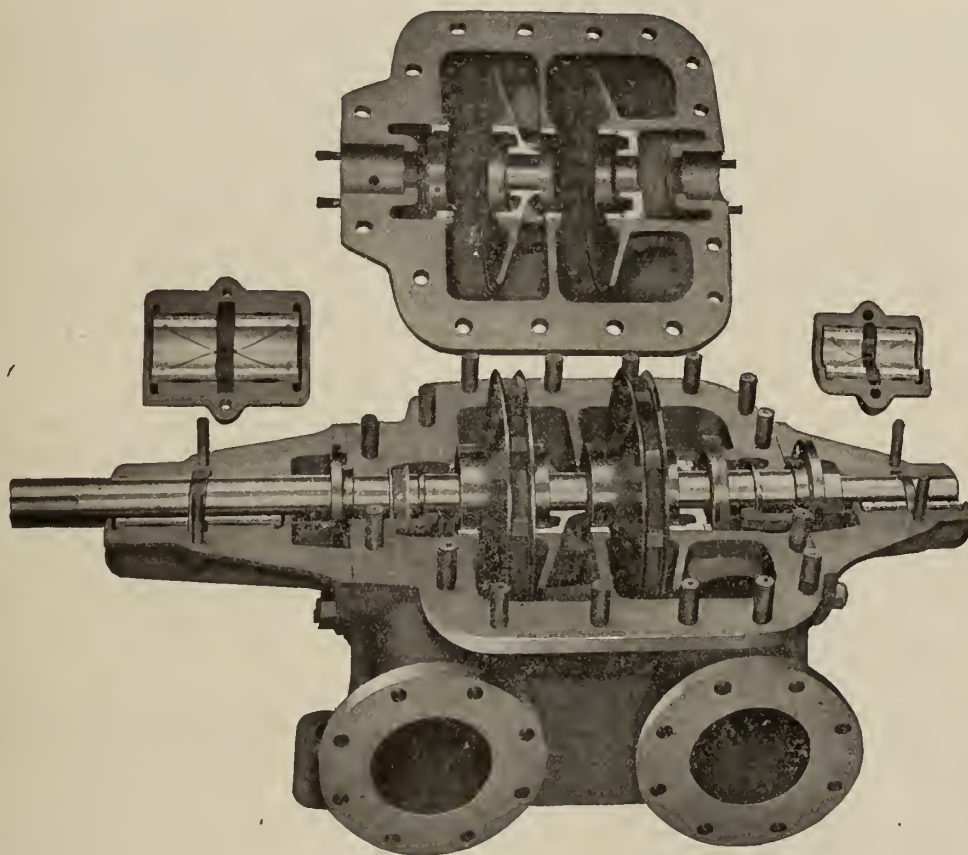


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## For Mines and Metallurgical Plants



Interior view of two stage split case Centrifugal Pump.

Hill-Tripp Pumps are made for all capacities and heads and arranged for Motor, Steam Turbine or Belt Drive. They have many superior features not found in other makes. High efficiency is obtained by the special design of the impeller and this efficiency is maintained indefinitely. No high velocity water comes in contact with the casing, making this Pump ideal for gritty water. The impeller and casing are made of special alloys for acid mine water or chemical solutions.

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CLYDE PATENT WIRE ROPE WORKS,

Rutherglen, Glasgow, Scotland

## WIRE ROPES

For Mining, Engineering and Shipping: For Hoisting and Haulage in Collieries and Mines: For Cableways and Aerial Ropeways: For Dredgers and Steam Shovels: Specially Flexible Ropes for Winches and Fast Hoists, Coal Towers and Cranes.

### OF THE HIGHEST QUALITY

made from special grades of Wire drawn to our specifications and carefully tested before being used. They are at work in all parts of Canada from Vancouver to Halifax and are everywhere recognised as the best on the market. Complete stocks held in all parts. Orders executed and quotations furnished by:--

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by adopting SULLIVAN ROCK DRILLS, you can count on rapid progress and low cost. There's a Sullivan Drill just suited to give maximum service under YOUR conditions.

We are efficiency experts in tunnel driving. Our services are at your disposal. Credentials include a long list of Sullivan-drilled tunnels, among them

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Ask for Bulletin 666-H.

## Sullivan Machinery Company

122 So. Michigan Ave. Chicago, U.S.A.

Montreal, Cobalt, Nelson, Spokane, Vancouver, Juneau.



# DRIFTING

## WITH THE

# "JACKHAMER"

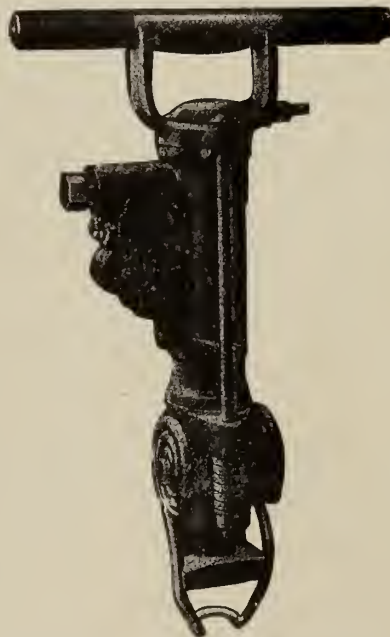
As evidence of how some mines appreciate the general utility of the "JACKHAMER" and make use of it to great advantage for work hitherto done by far more expensive methods the following drifting record should be of interest to mine managers.

The following is an actual report of the drifting done by a large copper company in its medium sized drifts with the "JACKHAMER."

"With one "JACKHAMER" 157½ feet were made in 28 shifts of eight hours each, or 5 feet 10 inches per shift. The miner was given three headings of close proximity in which to drill and when one round was finished he would proceed to another face drilling until shooting time. Usually two complete rounds were drilled and blasted in a shift. No drill support of any kind was used. The miner held the drill against his body and stood on the muck pile to reach the back and breast holes. The ground was medium porphyry and required 7 to 8 holes to break, so you can readily see it was not very soft."

### A Few "JACKHAMER" Features

- Self-rotation
- Self-lubrication
- All Steel Construction
- Non-freezing Butterfly Valve
- Effective Hole-cleaning Device
- Convenient Steel Holder
- Operates on Air or Steam



### A Few Uses in Mining

- Bench Work
- Ditch Digging
- Drilling Hanger Holes
- Hitch Cutting
- Shaft Sinking
- Tunnel Trimming
- Wall Trimming
- Drifting

THE "JACKHAMER" IS A GENERALLY USEFUL ONE-MAN TOOL OF GENUINE MERIT. WHY NOT TRY ONE ON YOUR OWN PROPERTY?

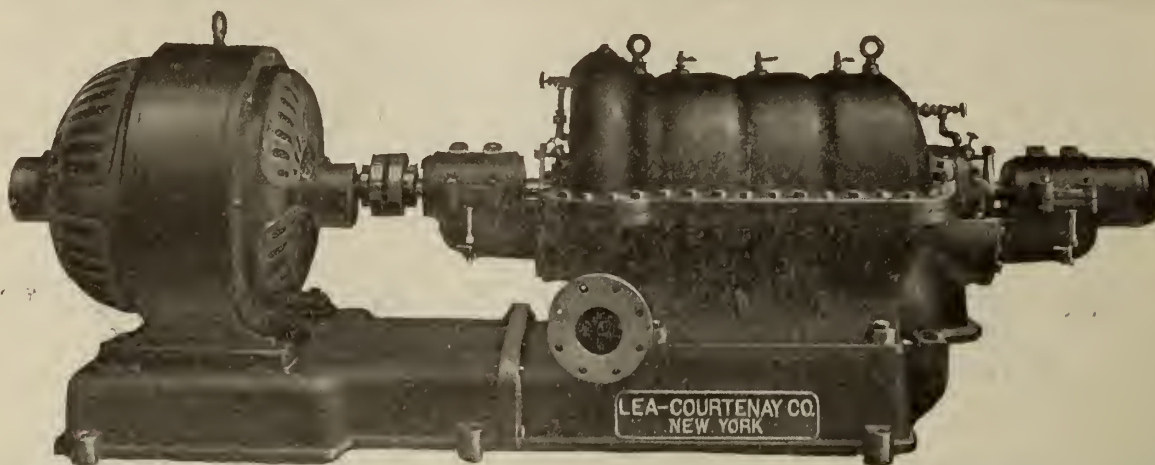
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Works : SHERBROOKE, QUE.

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## Lea-Courtenay High Lift Turbine Pumps

Mine Drainage  
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LIMITED

MONTREAL, P.Q.

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Save time and money by dispensing with your horse drawn vehicle and get a Ford Automobile. Bad roads don't "fizz" on the Ford---it is built to fit. New reduced 1915 prices now in force: 5 passenger Ford Touring Car, \$590.00; 2 passenger Runabout, \$540.00, F.O.B., Ford, Ont. We are agents for Temiskaming.

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The Martin-Senour Co., Ltd.  
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Beardmore Belting Co., Ltd.  
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Crucible Steel Co., of America

### WE CARRY IN STOCK:—

Rubber Belting, plain and stitched 1½ in. to 12 in. wide.  
Cotton Rubber Lined Fire Hose 1½ in. and 2 in.  
Air Drill and Steam Hose ¾ in., 1 in. and 1½ in.  
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All kinds of Rubber and Duck Packings.  
Genuine Garlock Spiral Packing.

## THE GEORGE TAYLOR HARDWARE, LIMITED

NEW LISKEARD (Head Office)

COBALT

COCHRANE





## Unharmful in the Midst of the Great Salem Fire Because Roofed with **J-M ASBESTOS ROOFING**

Flying sparks and burning embers were literally showered upon the roof of this raw cotton storehouse of the Naumkeag Steam Cotton Co., located in the midst of the recently flame-swept area of Salem, Mass.

Buildings all around it were burned to the ground, yet this building was absolutely unharmed because protected by J-M Asbestos Roofing.

The lesson to you of the great Salem fire is: Do not use wood shingles or other inflammable roofing.

Do not be deceived by low first cost, into buying anything but J-M Asbestos Roofing—the roofing of known quality—the roofing that will not fail you should the fire test ever come—the roofing that spells economy for you because of the years of service it affords and the fact that it never requires painting nor repairing.

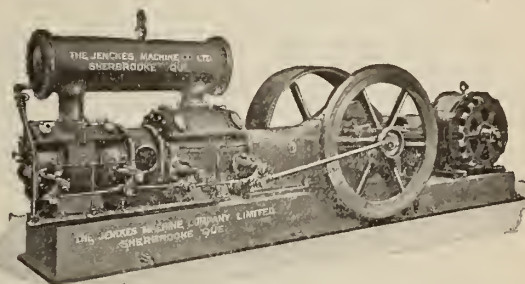
Comes in built-up form and in rolls. Latter easily applied by means of J-M Cleats, packed free with each roll.



**The Canadian  
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## Synopsis of Coal Mining Regulations

**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B.—Unauthorized publication of this advertisement will not be paid for.—58782.

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Sullivan Diamond Drills, Compressors,  
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Camp and Kitchen Supplies, Gen-  
eral Line Light and Heavy  
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We will be pleased to have your specifications  
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"IT WILL PAY YOU TO GET OUR PRICES."

Our Large Stock Guarantees You the Most Prompt  
Delivery on All Orders.

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LIMITED

COBALT

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### Milling and Mining Machinery

Shafting, Pulleys, Gearing, Hangers,  
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SOLE MAKERS  
OF  
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MANGANESE STEEL

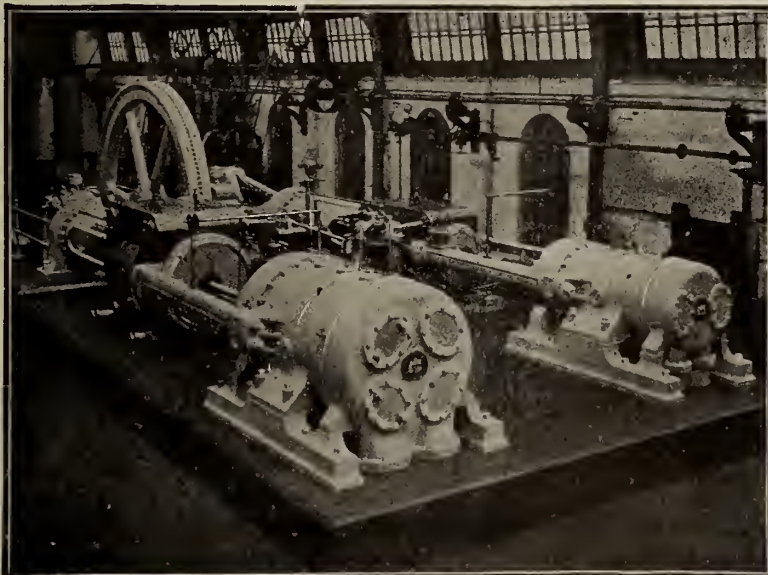
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Nova Scotia

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Collieries at Glace Bay, C.B., and Springhill, N.S.

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If so, you will be interested in the fact that the

## Michigan College of Mines, Houghton, Mich.

will, during the coming year, pay particular attention to men who attend to take courses for such special purposes. Write to its president, telling him just what you would like to take up.

The College is located in the heart of the great **copper mining district of Lake Superior**, and the surrounding mines, mills, smelters, and other industrial plants, together with its methods of work, give it unusual facilities for serving men like you.

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The following machinery has been put out of service by an electric installation and is offered for immediate delivery, f.o.b. cars Stellarton, Nova Scotia.

- 1 Novelty Iron Works Steam Hoisting Engine. Duplex cylinders, 16" diameter by 42" stroke. Geared to 2 cast iron drums 9' diameter by 56" wide. Gear ratio 3 to 1, also 6,500' of 1" steel cable.
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- 1 Jeansville Duplex Triple Expansion Pumping Engine, Steam cylinders 19", 27" and 44" diameter, by 36" stroke. Water cylinder 9" diameter, together with jet condenser and condenser pump. Outfit capable of handling 1,000 gallons per minute against 1,800 feet head.

Very low prices.

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**Acadia Coal Company, Limited,**  
Stellarton, N.S.

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## METALLIC NICKEL

Prime Metal for the manufacture of Nickel Steel, German Silver, Anodes and all Alloy purposes.

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If you have anything to do with Rock Drills, you have, probably, been disgusted with them many times and wished you were running by hand. You are striving for fewer delays, lower mining costs, increased tonnage, and increased profits, and cannot afford to leave anything untried which would aid in the attainment of the above.

Can you afford therefore to pass by

THE

## "CLEVELAND" STOPE DRILL

and not give it a trial when we can guarantee that it will relieve you of this part of your troubles.

There are so many reasons "why" that we haven't space enough here to enumerate them, but will you please

Write for Bulletin No. 30.

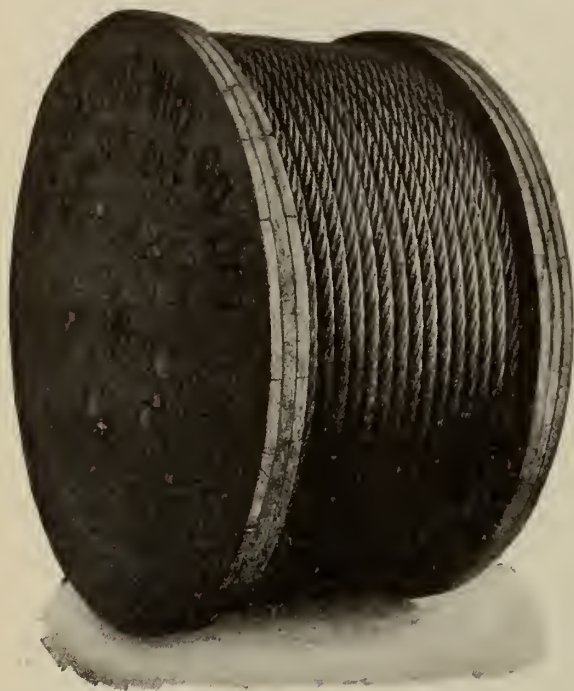
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Successors to  
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 extra high breaking strain for deep shafts.  
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ASK FOR OUR NEW ROPE CATALOGUE

The

**B. Greening Wire Co.**  
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**Manufacturers of Hammered and Rolled Steel for Mining Purposes**

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SPECIAL ATTENTION PAID TO MINERS' REQUIREMENTS. CORRESPONDENCE SOLICITED.

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As superintendent or foreman, by one who has had wide experience in Mechanical Construction, Draughting, Designing and Erecting of Mining Plants, Marcus screens, wash plants and buildings, cost estimates and supervision of all kinds of steam engines, boilers, air machinery, etc. References. Will accept small salary until value of services is demonstrated.

Apply Box 8, CANADIAN MINING JOURNAL, Toronto



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Capital Paid Up        \$7,000,000  
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Men are but gilded loam  
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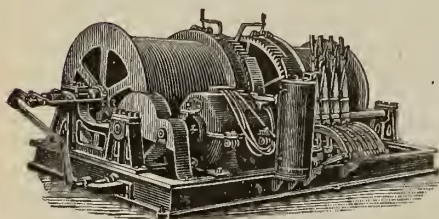
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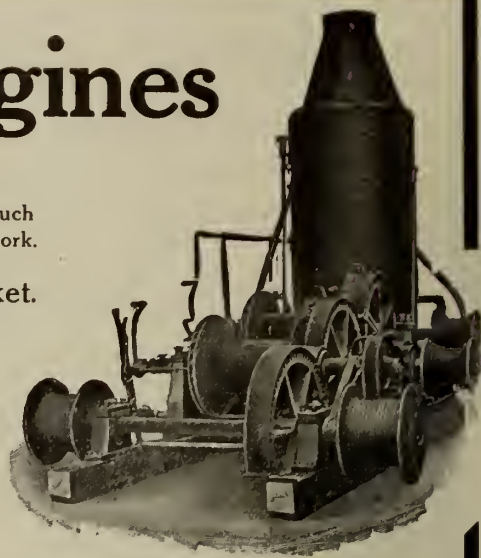
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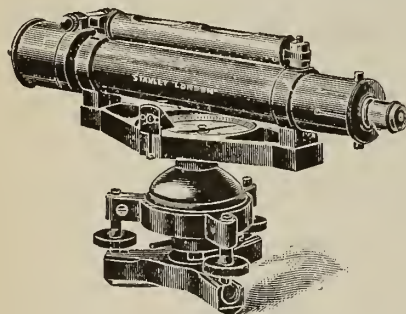
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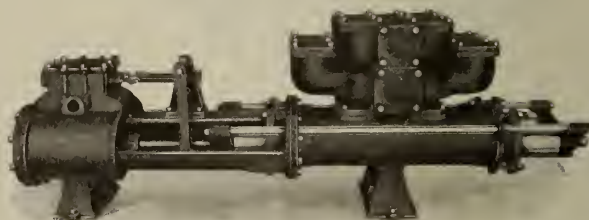
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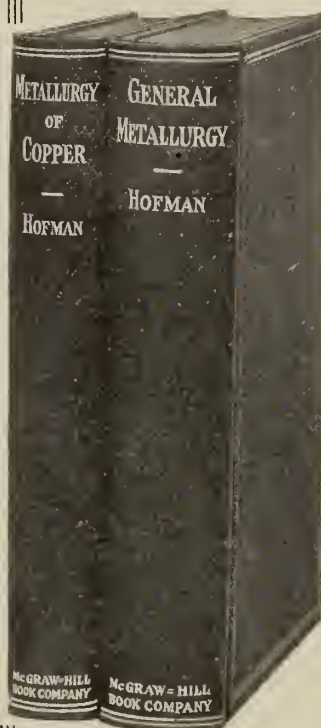
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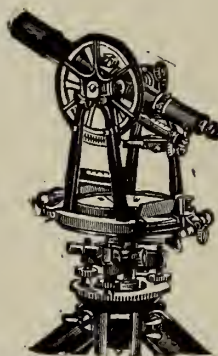
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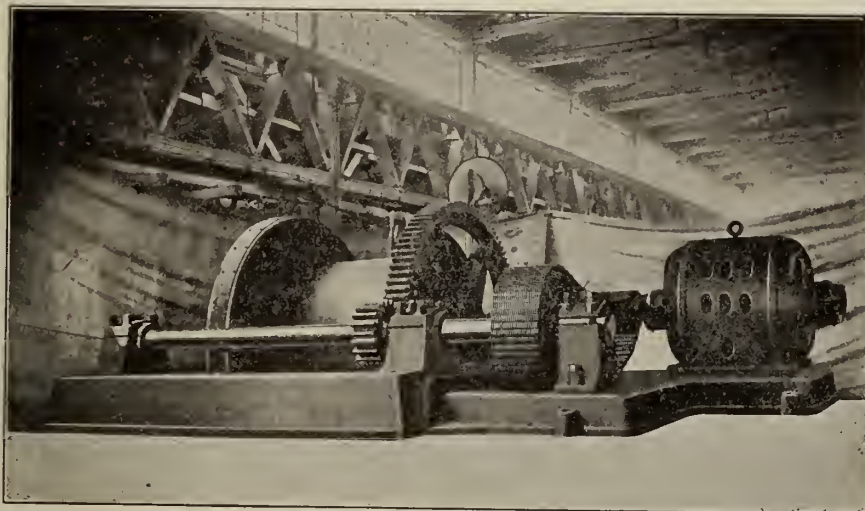
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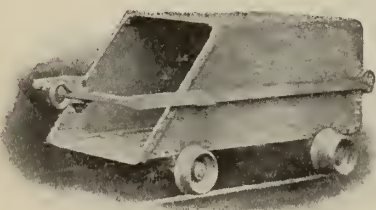


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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, September 15, 1914.

No. 18

## The Canadian Mining Journal

With which is incorporated the

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Editor

**REGINALD E. HORE**

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## SILVER MINING

The outlook for silver mining companies is now much brighter than in the first few days of the war. A market has been found for silver ore, and the prospect of an advance in price of the metal is in some quarters considered very good. At Cobalt the few important mines which were closed down are now producing again.

Transportation has been made safer on the Atlantic by the driving of the enemy's warships from the trade routes. The risk of shipping even such a valuable cargo as silver bullion will, it is hoped, soon be a small one. In the meantime bullion is being produced and stored.

As the Cobalt district produces about thirty million ounces of silver annually, an amount equal to one-half of the production of the United States, an entire loss of the market for silver even for a few months would have been seriously felt in Northern Ontario. The industry gives profitable employment to several thousand men and pays handsome dividends to the stockholders. It is therefore a pleasure to record that the pessimism of the first few days has given way to optimism.

Many forces have been at work to protect the industry. The companies could scarcely be expected to have provided for such an emergency. Some were fortunately in a position to continue operations in spite of the temporary loss of a market for silver or silver ore. Others found themselves in embarrassing positions, and discontinued work while studying the situation. It is to be hoped that the companies which dismissed their men will be able to show that such action was necessary. There seems to have been undue haste, coupled with a disregard for the fortunes of employees. If it was done simply to save money for dividend purposes, it was inexcusable. Loyal employees should be given more consideration.

## SILVER FOR COINAGE

In the United States Senate during the past few weeks a determined effort has been made to obtain Government assistance for the silver producing mines of the Western States. As a result there has been passed a bill providing for the purchase by the Government of 15,000,000 ounces of silver. It is not expected that this amount will be immediately needed, nor is it likely to be purchased unless the price falls below 53 cents per ounce. According to Senator Thomas the amount necessary for the purposes of subsidiary coinage seldom exceeds 3,000,000 ounces per year. Senator Smoot explained that the bill only provides that the Secretary of the Treasury can anticipate the requirements for the purchase of silver up to 15,000,000 ounces.

In the discussion on the bill interesting points concerning the use of silver for coinage were brought out. Senator Smoot said:

"Not until the end of the Franco-Prussian war, when Germany stood with her heel upon the neck of crushed and prostrate France, levying upon her a war tribute of five thousand milliards of francs, to be paid before her territory would be evacuated, was there any serious disturbance in the monetary world between the operations of gold and silver as money, which were conjointly discharging the financial obligations of all peoples and were given equal credit in the markets and exchanges of every civilized nation of the world. It was under these circumstances that the German Diet deliberately demonetized one of the metals, the favorite metal of the people of France, the metal which its citizens hoarded in their savings, which always maintained its standard of equality at a fixed ratio among that great people and all its customers. For the purpose of doubling the burden upon that crushed and conquered people the monstrous crime of silver's demonetization was conceived and carried into execution, thus disturbing the financial equilibrium all over the world. This action was followed by the United States in 1873 by similar legislation, enacted at a time when silver bullion was intrinsically worth more than silver coin, notwithstanding the pretence that such legislation was essential to overcome an impending flood, a threatening overflow, in overwhelming abundance of the white metal to the disturbance of all values and the probable disintegration of business"

Senator Newlands, speaking of the monetary situation, said:

"I do not propose to go into all of the intricacies of the money question, but I do wish to present in a few words the monetary situation of the world. In 1873 the movement for the demonetization of silver among the principal countries of the world culminated. The claim was made at that time that gold was the only stable measure of value; that the largely increased production of silver lessened the value of that metal as a money metal, and that the stable production of gold insured it as a stable standard of value. How futile events have proved that reasoning to be.

"The world starved for the want of money from 1873 until 1896, during which period the production of gold did not materially increase, while the increased production of silver was largely utilized for money. Then an increase in the production of gold took place, as a result of which the world had in 1913 an annual production 300 per cent. greater than the production of 1893. During that period the production of silver has increased only 30 per cent., proving that, so far as production is concerned, silver is a more stable metal than gold itself.

"During this time we have not as yet found enough metallic money to satisfy the demands of the world for money, and there are in South America a thousand million dollars of paper money with almost no metal back-

ing it, and we have in this country in our greenbacks and in our national bank notes about a billion dollars more of uncovered paper money."

These are statements of two only of many well posted men who believe that silver should be more largely used for coinage. Should such views prevail there will doubtless sooner or later come a sharp rise in the price of the metal. Under such conditions, the life of the Cobalt mines may be much longer than even the most optimistic had dared to hope.

## GOLD MINING AT KIRKLAND LAKE

Since the war broke out there have been numerous reports, some of which have unfortunately been published in our columns, to the effect that development work had been stopped at Kirkland Lake. It is true that outside prospecting has been discontinued; but the development work at the Tough-Oakes mine is being carried on as usual. The work at both shafts is chiefly drifting. The stoping so far done is for the most part merely "cutting out" work. We are advised that development continues to give excellent results, and that the ore placed in sight during the work for the month of August has a gross value of \$250,800. The production during August was 2,950 tons of ore, having a gross value of \$102,341.

This is a very creditable showing, and should give confidence to those who have interests in the Kirkland Lake district.

The Tough-Oakes has started construction on a 100 ton mill. The excavation is completed and concrete forms are being placed. The erection is under the direction of Mr. James Johnston, who erected and operated the mills of the Nipissing Mining Co. at Cobalt.

## THE HOLLINGER MINE

Five years ago prospectors discovered gold ore in the Porcupine district. No mining had been done in the district. The deposits were located in the midst of a heavily forested country and twenty-five miles from the nearest railway. A great change has taken place. One of the mining companies operating in the district has already mined over \$5,000,000 in gold and made a profit of over \$3,000,000.

Many difficulties were overcome. The cost of developing the property was high owing to its location. Disastrous fires checked progress. An ill-advised labor strike, while unsuccessful, increased cost of operations. In spite of the many difficulties encountered the company has now made a profit greater than its capitalization.

The company gives employment to several hundred men and is an important factor in the development of Northern Ontario.

While substantial progress has been made the Hollinger is as yet only in its infancy. The mine has splendid prospects of becoming one of the best in the world.



## THE MINING UNIONS AT BUTTE

For several years Butte has been the stronghold of the Western Federation of Miners. It is so no more. A new organization has been formed at the expense of the old one. Little improvement has been made. There has been a change in leadership; but the new union vies with the old one in making a reputation for violence..

By resorting to mob rule the leaders of the Independent Union have taken control of Butte. The citizens who attempted to organize for protection against the Union leaders have been threatened with violence. The character of the president, Muckie McDonald, is indicated in a street speech:

"There is one thing I want to say to you people. We understand that the sheriff's office is planning to get the leaders of this union and that they expect to pick us up one at a time. Now I want to serve notice that if there is anything of that kind doing, you want to report it to headquarters at once. We don't stand for anything of that sort, and we serve notice right now that there will be some direct action if they try anything of that kind. We understand that some of the business men are in on it, too, and I don't know whether the city hall is in it too or not, but we want it understood that the new union is running Butte. If there are any skunks in this crowd we will take care of them, too. We didn't follow the example of the old union. We took the men who were our enemies and told them to get out of town; but we didn't mistreat them, and we didn't beat them up. We treated them all right, but told them to get out of town. We understand that the sheriff's office went and brought them back, but it won't be healthy for them to show up; that's all. Now, we are going to be peaceable; no one can say that Muckie McDonald has broken any law. We will not start anything, but if they start anything they had better look out. They will get some direct action."

It is not likely that American citizens will long submit to the rule of such men as Muckie. The mine operators have announced that Butte is now an open camp. The Western Federation leaders have brought ruin to that organization. The Independent Union has not proven worthy of recognition.

### PEACEFUL GERMANS AND AUSTRIANS ARE SAFE.

It has come to the attention of the Government that many persons of German and Austro-Hungarian nationality who are residents of Canada are apprehensive for their safety at the present time. In particular the suggestion seems to be that they fear some action on the part of the Government which might deprive them of their freedom to hold property or to carry on business. These apprehensions, if they exist, are quite unfounded.

The policy of the Government is embodied in a Proclamation published in the Canadian Gazette on 15th August. In accordance with this Proclamation restrictive measures will be taken only in cases where officers, soldiers or reservists of the German Empire or of the Austro-Hungarian Monarchy attempt to leave Can-

ada, or where subjects of such nationalities engage or attempt to engage in espionage or acts of a hostile nature, or to give information to or otherwise assist the King's enemies. Even where persons are arrested or detained on the grounds indicated they may be released on signing an undertaking to abstain from acts injurious to the Dominion or the Empire.

The Proclamation after stating that "there are many persons of German and Austro-Hungarian nationality quietly pursuing their usual avocations in various parts of Canada and that it is desirable that such persons should be allowed to continue in such avocations without interruption," directs as follows:

"That all persons in Canada of German or Austro-Hungarian nationality, so long as they quietly pursue their ordinary avocations be allowed to continue to enjoy the protection of the law and be accorded the respect and consideration due to peaceful and law-abiding citizens; and that they be not arrested, detained or interfered with, unless there is reasonable ground to believe that they are engaged in espionage, or engaging or attempting to engage in acts of a hostile nature, or are giving or attempting to give information to the enemy, or unless they otherwise contravene any law, order-in-council or proclamation."

Thus all such persons so long as they respect the law are entitled to its protection and have nothing to fear.

### ONE TASK FOR ALL

By Rudyard Kipling, in London Times.

For all we have and are,  
For all our children's fate,  
Stand up and meet the war—  
The Hun is at the gate!  
Our world has passed away  
In wanton overthrow;  
There's nothing left to-day  
But steel and fire and woe.  
Though all we know depart,  
The old commandments stand—  
In courage keep your heart,  
In strength lift up your hand.  
Once more we hear the word  
That sickened earth of old,  
No law except the sword  
Unsheathed and uncontrolled;  
Once more it knits mankind,  
Once more the nations go  
To meet and break and bind  
A crazed and driven foe.  
Comfort, content, delight,  
The ages' slow-bought gain,  
They shrivel in a night—  
Only ourselves remain  
To face the naked days  
In silent fortitude,  
Through perils and dismays,  
Renewed and re-renewed.  
Though all we made depart,  
The old commandments stand;  
"In patience keep your heart!  
In strength lift up your hand!"  
No easy hopes or lies  
Shall bring us to our goal—  
But iron sacrifice  
Of body, will and soul.  
There's but one task for all,  
For each, one life to give;  
Who stands if freedom fall?  
Who dies if England live?

## ASBESTOS IN SOUTHERN QUEBEC\*

By J. A. Dresser.

The controlling supply of asbestos for the world is obtained from southern Quebec, 150 miles or less north of the international boundary line between Canada and the United States, and about 75 miles south of the city of Quebec. The principal production is furnished by eight mines, seven of which occur within a distance of six miles. There are also several smaller properties in the vicinity. The industry was begun in a small way some 35 years ago and has advanced more or less regularly ever since. The annual production now exceeds 100,000 tons and its value is about \$3,000,000. It represents over 80 per cent. of the world's production.

Asbestos has been known in the eastern townships of Quebec since 1847, when attention was called to it in an official report by Sir William Logan, the first Director of the Geological Survey of Canada, but it was not until 30 years later that it came into com-

The growth of the industry is best known by quoting the production of a few years taken at regular intervals:

	Production,	
	Tons.	Value.
1878.....	50	.....
1882.....	810	\$52,650
1892.....	6,082	390,462
1902.....	30,219	1,126,688
1912.....	111,175	3,059,084

All the mines have easy railway access. The principal shipping stations are Thetford Mines, Black Lake, and East Broughton on the Quebec Central Railway, a part of the Canadian Pacific system, and Danville, on the Grand Trunk Railway. Thetford Mines is about 76 miles from Quebec, 67 miles from Sherbrooke, and 168 miles from Montreal. The other stations men-



Geological Party at Black Lake, Quebec

mercial importance. The largest deposits, those of Thetford and Black Lake, were found in 1877 during the construction of the Quebec Central Railway. Work was begun upon them almost at once and has been continued ever since.

The Danville mine, the next largest producer, was opened in 1879, and the slip-fiber deposits of East Broughton were located shortly afterward.

For the first 15 years only the "crude" asbestos was recovered; that is, fiber long enough to be extracted by hand cobbing. Although this is still a valuable part of the production, it is now a relatively small part of the total output.

After several trials, a process of mechanical concentration was begun about 1893 by some of the pioneer operators of the district, which with many modifications has been successfully used ever since. Although there have been numberless changes in the operation and appliances, the present practice is a direct development of the first principles of the earliest attempts at concentration, and much credit is due to those who originated it. Its effect may be realized when it is stated that in leading mines to-day 95 per cent. of the quantity and 75 per cent. of the value of the total production is obtained by mechanical concentration.

tioned are from 4 to 18 miles from Thetford Mines, except Danville, which is some 50 miles distant, on the Grand Trunk Railway, 88 miles from Montreal and 86 miles from Quebec.

The asbestos deposits are found in the hilly country of southern Quebec known as the Eastern Townships. Much of the district has been settled for upward of 100 years and is now generally occupied by small dairy farms. The hills are a continuation of the Green mountains of Vermont, a part of the Appalachian system.

The geological structure is complex. There has been intense folding, faulting, and regional metamorphism. Glacial drift conceals a great part of the rock surface, but glacial erosion has been an important factor in uncovering and exposing the deep-seated rocks in which asbestos occurs. The asbestos is in a series of basic igneous rocks which occur in stocks and sills that have intruded sedimentary strata of Cambrian, Ordovician, and in places of Silurian age. These basic intrusives are part of the well-known and extensive series which appears at frequent intervals in the Appalachians from Georgia to Newfoundland. The commercial production of asbestos is almost entirely limited to a small district.

\*A paper to be presented at the Pittsburg meeting, A. I. M. E., October, 1914.



The principal types of igneous rocks are peridotite, pyroxenite, gabbro, and diabase. They are products of differentiation from a single magma, and are characteristically arranged in the order given above from the base upward in sills, and from the center outward in stocks. This order, it will be noted, is that of de-

greater number are  $\frac{1}{2}$  in. or less in width. The fibers, as the name implies, lie crosswise the vein.

The veins rarely reach a length of 200 ft., but are usually very much shorter, the greater number being only a few feet in length. They run in all directions through the rock, in places cutting one another abrupt-



Asbestos Veins in Peridotite, Black Lake, Quebec

creasing basicity and density. A relatively small amount of hornblende granite which is also present has generally been intruded a little later than the basic rocks.

Peridotite is altered in important amount to serpentine, and pyroxenite generally to soapstone, but in places probably also to serpentine.

#### Character and Mode of Occurrence of Asbestos.

The asbestos is entirely of the chrysotile variety, and has essentially the same chemical composition as serpentine, in which rock only it occurs. There are two

ly, but more frequently uniting at meeting. A careful examination shows that many of the larger and more persistent veins show an approach to a rectangular arrangement, and probably represent joints in the primary rock. Others have a roughly parallel order and denote fractures due to regional compression, while many smaller veins truncate the corners of rectangular joint blocks in shell-like form.

**Vein Structure and Origin.**—The veins are usually divided into two parts by a thin seam of iron ore, generally magnetite, which is parallel to the sides and near



An Asbestos Mine in Quebec

types of asbestos in this district: namely, "cross-fiber" asbestos, and "slip," "parallel," or "mass fiber," asbestos, the three terms being used almost interchangeably.

**Cross-fiber Deposits.**—This variety furnishes the major production, both in quantity and value. It occurs in veins up to  $2\frac{1}{2}$  in., or rarely 3 in. wide; the

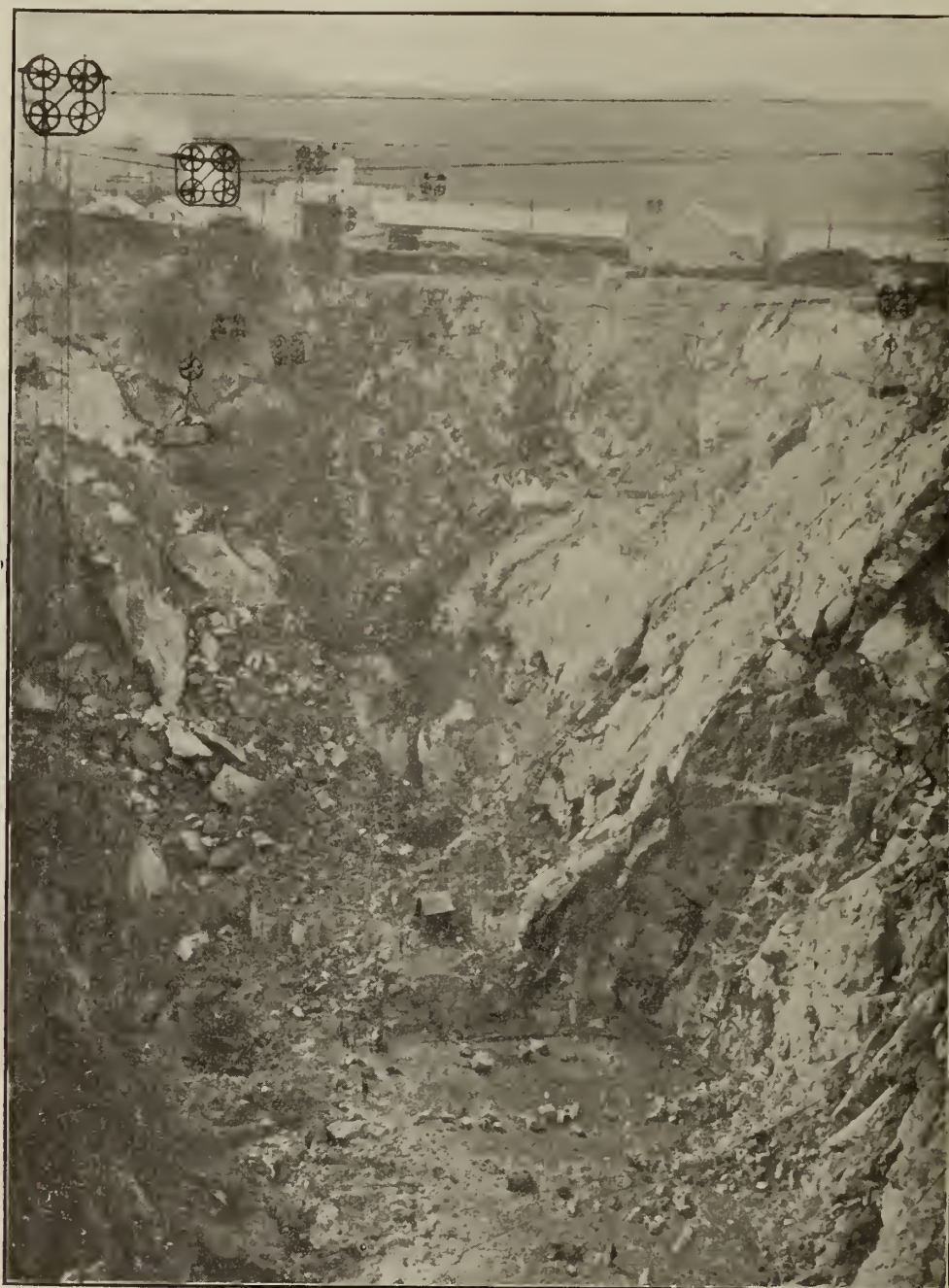
the center of the vein. Bordering the veins on each side there is invariably a band of serpentine about three times the width of the vein. The country rock near the veins is peridotite of the most basic phase (dunite) that occurs in the district. There is incipient serpentinization in all parts of the peridotite, but commercial asbestos is found only between walls of com-



pletely serpentinized rock whose thickness is proportional to the width of the vein. Microscopic and chemical evidences, as well as the distribution of the veins, point conclusively to the origin of the asbestos by alteration and recrystallization of the country rock *in situ*. Microscopically it is evident that the asbestos fibers have grown outward on each side from the seam of iron ore mentioned above; chemically there is no distinction between the asbestos and serpentine, while an essential difference between serpentine and peridotite

of iron ore within or at the sides of the veins, and the correspondence of the position of the principal veins to that of joint and other fractures, the iron seams are believed to mark the original channels by which circulating waters have been introduced which produced the hydration of the peridotite and its alteration to serpentine, a certain portion of which has crystallized as asbestos.

The source of the water has given rise to considerable discussion. The fact that much excellent asbestos



Mining Asbestos in Quebec

is that the former contains 12 to 14 per cent. of water. The position of the veins and the deep-seated character of the rock make it impossible that such open fissures ever existed where the veins are now found. While much remains to be explained both as to the processes and their causes, the facts are self-evident that zones of the country rock have been altered to serpentine and proportionate parts of these have taken the form of asbestos veins. From the persistence of the seams

has been found near granite dikes has given rise to the opinion that magmatic waters accompanying the intrusion of these has been the cause. Locally there is much to support this view, but viewed broadly the small amount of granite as well as its variable distribution make it improbable that it has been the chief cause. Magmatic waters accompanying the peridotite itself are a more likely cause. Yet, this rock was solidified and was afterward fractured both by con-



traction (joints) and by regional deformation before the waters could have been introduced. On the other hand, the present water level is comparatively near the surface in this district, and, as the region is one that suffered great erosion in glacial times, the present surface may long have stood below ground-water level. It is not proved that meteoric waters are not a competent cause to produce these effects and at least a share in the cause may probably be attributed to them.

In the deepest workings yet made, which are a little more than 200 ft. deep, there is no apparent change in the quantity or quality of the product, and no desposit of serious importance has yet been exhausted. The principal deposits are found in the most basic parts of the peridotite (dunite); that is, near the base of sills or toward the central parts of stocks. Owing to glacial erosion having been more effective on the north side of the stocks several deposits are found near the north edge of the peridotite core of the principal stock.

**Slip-Fiber Deposits**—Slip-fiber or parallel-fiber asbestos is a fibrous phase of serpentine in which the fibers are arranged parallel to adjacent cleavage faces in the rock. In places the rock is almost entirely in a fibrous condition and the name "mass-fiber" is sometimes used for such occurrences. It is probable that this class of asbestos has been derived from pyroxene.

Where slip fiber is abundant the proportion of asbestos in the rock is much higher than in the case of the cross-fiber occurrences. But much of the slip fiber is short and the proportion that is recoverable and useful, though higher, is not so greatly different from that obtained from the cross-fiber mines. Only a little "crude" asbestos is obtained from deposits of this class.

#### Mining and Dressing.

**Mining**.—The distribution of the asbestos is such that all the rock within the area mined must be handled. Except in one mine where underground work is quite extensively carried on in winter or for development purposes, the mining, or rather quarrying, is all open-cast work. The ground is cut down in benches, generally 6 to 12 ft. high, which are carried across the floor of the pit so as to afford sufficient working face. Several of the pits have reached a depth of 200 ft. from the original surface and are from 600 to 1,200 ft. or even more in length.

**Handling**.—Hoisting is done by means of cable derricks with boxes carrying about a ton each. In one case a tramway enters the pit through an inclined tunnel and the rock is hauled out in cars drawn by a cable. Hauling on the surface is done by small locomotives with side-dumping cars of 4 or 5 tons capacity.

**Dressing**.—The separation of fiber from the rock commonly begins in the pit. Rock containing "crude"—that is, veins  $\frac{3}{4}$ -in. or more in width and of good quality—is sent to the cobbing sheds for hand separ-

ation, and asbestos that is liberated by the breaking of the rock in the pit is collected in hand boxes; dead rock is taken to the waste dump, and the remainder, usually 35 to 60 per cent. of all the rock handled, goes to the ore bins, or directly to the mill for mechanical concentration.

The milling practice varies somewhat in different mills, but is very similar in all. It consists essentially of coarse crushing, drying, and alternate finer crushings and screenings. At each screening, the asbestos then liberated is drawn off through overhead pipes by suction fans and collected in settling tanks. When thoroughly screened from dust and classified according to length of fiber by means of a rotary screen, the different grades pass to their respective storage bins, or in some mills are mechanically bagged.

In the coarse crushing, jaw crushers are used. Gyrotories and frequently rolls are used for the finer crushing. When rolls are used special appliances are needed for teasing out the fiber, which becomes compressed into matted sheets by the rolls. The final crushing of the rock is effected by a specially designed "cyclone." This consists of two "beaters" or fans of chilled iron, in shape like the screw propeller of a boat and weighing upward of 100 lb., which revolve at a speed of 2,000 rev. per minute, or more, in a closed chamber. From the rock fragments thus driven together the smallest particles of asbestos are released and collected as before.

Suction fans for the removal of dust from the cyclone, the classifier, and sometimes from the mill, are important accessories to the equipment. Magnets are usually placed over the shaking screens to eliminate particles of iron ore. The average recovery of cross fiber seems to vary at different properties between 3 and 8 per cent. of the rock treated; slip fiber, perhaps 2 or 3 per cent. higher.

**Product**.—The fiber recovered in the mill is classified into three or more grades, the crude asbestos usually into two grades. The adoption of a standard classification has been discussed, but owing to local differences in the character of the fiber, as well as other causes, no standardization has yet been effected. Each mine follows its own grading and there is a lack of uniformity in the products of different mines. An arbitrary classification that has been adopted by the Department of Mines of the Province of Quebec is as follows:

#### Crude Asbestos, Hand Cobbed.

- No. 1—Value \$200 per ton or more.  
No. 2—Value less than \$200 per ton.

#### Mill Stock, Mechanically Separated.

- No. 1—Value \$45 per ton or more.  
No. 2—Value \$20 to \$45 per ton.  
No. 3—Value less than \$20 per ton.

The production of 1912 was as follows, according to the classification given above:

Quantity of Rock Mined 1,870,608 Tons.				Shipments		Stock on Hand	
Qualities	No. of Men Employed	Wages Paid	Tons.	Value	Av. per Ton.	Tons.	Value
Crude No. 1.....	.....	.....	1,914	\$510,785	\$263.16	867	\$221,215
Crude No. 2.....	.....	.....	3,766	379,445	100.76	2,867	310,596
Mill Sk. No. 1.....	.....	.....	3,682	237,203	64.42	2,370	137,106
Mill Sk. No. 2.....	.....	.....	32,682	1,018,960	31.17	8,234	301,774
Mill Sk. No. 3.....	.....	.....	69,097	912,691	13.21	6,838	131,206
Totals. . . . .	2,910	\$1,377,444	111,175	3,059,084	27.52	24,176	1,102,206



The stock on hand at the beginning of the year 1912 amounted to 33,751 tons, valued at \$1,583,076.

**Uses.**—A small proportion of the crude asbestos is used for making asbestos cloth and various fire-proof textiles. A much greater amount is used for covering and insulating purposes. Boards, shingles, and roofing felts for fire-proof construction, materials for electric insulation and protection from acids, and boiler and pipe coverings are the forms of manufacture in most common use. There is only one plant for the manufacture of asbestos goods in Canada, the Asbestos Manufacturing Co., at Lachine, Quebec. This plant makes shingles and other roofing materials, pipe covering, mill boards, and asbestos lumber for the Canadian and European markets. Its consumption is about 5 per cent. of the total output of the mines of Quebec. Approximately 75 per cent. of the output of these mines is exported for manufacture to the United States, and the balance to Great Britain, Germany, France, and other European countries.

#### Condition and Outlook for the Industry.

There has been a decrease of stock on hand during the past two years. This seems to indicate that the industry is emerging successfully from a critical condition into which it was thrown four years ago by a rapid overproduction, which resulted from some extravagant financial promotions.

The deposits are large and the principal mines seem to have almost inexhaustible reserves. Consequently the plants installed are of a durable character and around the mines substantially built towns have grown up. The labor is largely obtained in the locality. Many of the men own their houses, living conditions are favorable, and there have been no serious labor troubles in the history of the industry.

For the immediate future, or as long as mining can be done by open-cast methods, the cost will probably vary only with the nature of the ground, the depth of hoisting, and the price of labor and materials. But in methods of concentrating changes are more likely to take place. The present practice is the result of 20 years' experience, during which time many changes, and great improvements have been made. At present the practice of different mills varies considerably in details and probably also in efficiency.

The enlargement of the market for manufactured goods, which is steadily growing, depends largely on the skill and enterprise of the manufacturers and the supply of substitutes for asbestos. The constantly increasing price of lumber must improve the field for shingles and asbestos lumber, while the ingenious applications of asbestos for heat-resisting and insulating materials seem likely to give it a continued advantage over any substitutes at present known.

The absence of rival fields for so long a time is rather remarkable. Similar rocks in like associations are known in many parts of the world, yet the only sustained and growing production outside of Quebec is obtained from the Ural districts in Russia, the United States and South Africa being much smaller producers. In his report on Mining Operations in the Province of Quebec for 1912, T. C. Denis, Superintendent of Mines of Quebec, cites the following statistics for the year 1910, from the Colonial and Foreign Statistics of the Home Office, London. The quantities are given in metric tons and values in pounds sterling:

Cape Colony .....	1,273	£23,143
Cyprus.....	442	2,754
India.....	3	6
Rhodesia.....	301	3,320
Natal.....	2	15
Transvaal.....	70	2,575
Russia (approximate) ..	10,936	82,000
United States .....	3,350	14,036
<hr/>		
Total outside of Quebec	16,377	£127,849
Quebec.....	73,124	£548,184

## MINING IN BRITISH COLUMBIA

Nelson, B.C., Sept. 5.

As a result of representations made to him by Lorne A. Campbell, M.P.P., of Rossland, R. F. Green, M.P. for Kootenay, while at Ottawa during the recent emergency session took up with Hon. W. T. White, Minister of Finance, the question of some measure of assistance to the mining industry of this section during the present war.

In reply to Mr. Green's representations, Mr. White said that he had so many appeals for aid from various industries that it would be futile to attempt to deal with any individual or any one company. He was quite willing, however, that the arrangement which had been made with the Cobalt mine owners as to the handling of silver should be extended to British Columbia and to Kootenay in particular. Under this arrangement the Government undertook to assist in the handling of silver bullion. The Government would issue Dominion bills to banks equal to the amount of money the banks might advance to mining companies or smelters on the security of silver bullion backed by the notes of the mining or smelting companies. This, it was felt, would assist the mining companies in financing their business and continuing operations.

Mr. White also promised Mr. Green before the latter left Ottawa that he would take up with the general managers of the banks the question of the handling of lead. The Minister was very sympathetic and was very anxious to secure a solution of this problem on a business basis—the only basis upon which, of course, he would deal with it.

Commenting editorially the Nelson News says:

"The announcement that the Government is ready to assist in the handling of the silver product of this section and that the matter of dealing with the problem of marketing the lead output of the mines of the district is under consideration will be welcome news to the people of Kootenay. This, with the advance in the price of zinc, should mean an early resumption of operations of the silver-lead-zinc mines of this part of British Columbia.

"The effect of the resumption of operations generally it is not necessary to dilate upon. It will mean that to a very large extent business throughout the silver-lead-zinc mining sections of the Kootenay will be placed on as good a basis as before the outbreak of the war.

"It is to be hoped that the efforts of Mr. Lorne A. Campbell, M.P.P. for Rossland, and Mr. R. F. Green, M.P. for Kootenay, to put the mining industry back in its old position, despite the war, will be successful. And with two such men so keenly interested there can be little doubt but that this hope will not prove in vain."



## LAKE SUPERIOR MINING INSTITUTE ANNUAL MEETING

The meeting of the Lake Superior Mining Institute, which was credited to the Marquette range this year, will go down in the history of the organization as one of the most enjoyable of that body. Having entertained the association three times previously, it was decided to depart from the general custom of spending all the time at the mines, and take a side trip on the lakes to the city of Detroit. Marquette being the oldest of the iron ore ranges was very well known to nearly all of the Institute members, and to have held the party here for three or four days would have become somewhat monotonous.

It was not a good time for the most generous attendance on the part of the members. There are many new orders coming from the headquarters to the mine representatives, this being a most trying time in the metal as well as other industries. Men are being laid off, wages lessened, and changes made generally, and many could not leave their places who would, under more favorable conditions, have been present. Considering these things the number who did come exceeded the expectations of Secretary A. J. Yungbluth and others in charge of the meeting. At the dinner served at Wawonowin Golf Club, Ishpeming and Negaunee, about three hundred were present, while this number was exceeded at the whitefish dinner served at the Lake Shore Engine Works in the evening. This was a fine representation. On the lake trip there were about 140 members present, enough to make a right active, jolly party.

In Ishpeming there were the first aid contests at Union Park, beginning at 9.30 in the morning. This was the first time the Institute had staged anything like this, and it proved very interesting, and was well suited to the programme and to the mining industry. Twelve teams representing eight different mining organizations participated. They were lined up in a semi-circle in front of the grand stand, presenting, in their neat costumes, a very pleasing appearance. Each team had been well drilled, and when only a portion of them were working the rest stood at attention. Six men composed a team, five workers and one patient. There were ten events. Two one-man events; two three-men events, and the balance of teams events, which kept the teams busy until noon. Certain time was allowed each event, after which the gong was rung at the end of every minute until all had completed the event. For one minute overtime one point was deducted. Two minutes overtime barred the team from marking in that event, disqualifying them. There was some nervousness exhibited by several of the members of the teams at the outset, but despite this work was done well in every instance.

The exhibition was witnessed by a large number of people and there were many ladies in attendance. This promises to be a regular feature at forthcoming Institute meetings, and properly belongs here. It is an encouragement to the teams and is aiding a splendid work.

With the first aid contests ended the members were conducted to the Wawonowin Golf Club house, near by, where a very fine lunch was served.

The members then visited Union Park again, where there was what was reported to be a baseball game in waiting. It was between the old rivals, Ishpeming and Negaunee, leaders and tail enders in the Marquette Delta County League.

Here, the Cleveland-Cliffs Co. is sinking what will be when completed one of the deepest shafts in the iron country, it to go more than 2,000 ft. It is a circular

shaft, 17 ft. bore, and is to be concreted from top to bottom. It has been concreted to a depth of 150 ft., and will take about two years to finish. An excellent equipment has been provided for the work. In two hours recently 20 ft. of concrete was poured. The sinking here is done by a cage, which is working satisfactorily.

The next stop, and the last at the mines, was at the Negaunee mine of the Cleveland-Cliffs Co. This is one of the neatest, we may say the neatest, of any of the iron ore mines in the Lake Superior country. It's a model, and suggests thrift. The equipment is electrical from top to bottom, the final word in mine operation. It's the very best known. Man has not conceived or invented anything more efficient than is to be found here. The mine is raising about 1,100 tons of ore daily, working in a quiet way, suited to the market. Every member was loud in his praise of the appearance of everything at this location. Steel and concrete play important parts in the construction work. The shaft is concreted as are tunnels leading into it. Stockpile trestles are steel and concrete. It's a solid order of things and meant for business.

From the Negaunee mine the party went on by automobiles to Marquette. It was a dusty ride, but enjoyable, their being about sixty cars in line. The Lake Superior and Ishpeming Railway Co.'s ore dock was inspected. It's the only all steel and concrete ore dock in the world, absolutely fireproof. It's all electrically operated, too. There are 200 pockets each with a capacity of 300 tons.

After inspecting this dock the Institute members automobilized to the Lake Shore Engine Works, where the plant was inspected, and where a new ore loading machine to be used underground in drifts was one of the objects attracting attention. This loader was working in a timbered drift, on surface, handling gravel, which it did efficiently. Various expressions were heard as to its probable practicability, but this is to be fully tested at the Balkan mine, Alpha, Menominee range, in the near future. The machine went through all the motions of a steam shovel smoothly.

The Lake Shore Engine Works, besides having a reputation for mining and other machinery, is also known among the Institute members for its whitefish. Once tried they are always in demand, so that Mr. Flodin has found a task, at each reappearance of the Institute on this range, in providing one of his famous dinners. This dinner was served in the big foundry room, which had been finely decorated for the occasion. At the entrance, in the form of an immense wheel, was an electric sign welcoming the members. More than three hundred sat down at the tables. The fish was broiled to a turn and was delicious. The fishermen must have had a splendid catch that morning to care for all who were served and who asked if they could please have some more. With the fish were many things, being proper accompaniment.

At eight-thirty in the evening the members attended the Marquette Theatre, where a special moving picture show had been prepared for them. There were two intensely interesting reels by the Bureau of Mines in co-operating with Witherbee Sherman & Co., showing surface and underground views at Mineville, N.Y. Through the pictures first aid and rescue work was frequently shown. A reel of pictures provided by Mr. J. M. Longyear showed scenes in and about the DeBeers mines, Kimberley, diamond and gold operations being illus-



trated. It was exactly right for a mining institute programme.

The party left Marquette at six in the morning. St. Ignace was reached on schedule time and the boat found waiting for them at the dock. Here they were joined by Dr. Allen and his party of geologists, 24 in number.

The trip on the boat from St. Ignace was a pleasant one, the weather being favorable. The members received the best of attention and were well cared for.

The first business session was held Tuesday afternoon on the boat with President W. H. Johnston of Ishpeming presiding. A number of papers were read and discussed, and short talks made by several of the state geologists.

Another business meeting took place in the evening, when the reports of committees were received and officers elected to serve during the ensuing year. L. C. Hardenberg, of Ironwood, range superintendent for Pickands, Mather & Co., was chosen president, and A. J. Youngbluth, of Ishpeming, was re-elected secretary. E. W. Hopkins, of Commonwealth, was re-elected treasurer.

Wednesday afternoon visits were made to Detroit Copper and Brass Rolling Mills, the Detroit Iron and Steel Co.'s furnaces and the Semet-Solvay Co.'s coke ovens.

Thursday the party looked over the Ford plant and the Chalmers factory.

The people of Detroit extended the party a hearty welcome, and spared nothing to make their stay comfortable and pleasing.

Gogebie range will entertain the Institute next year.

### HOLLINGER.

For the four weeks ending August 12th the Hollinger Gold Mines, Ltd., shows gross profits of \$171,975.76. Working costs during the period were \$68,578.37, and the total ore hoisted was 16,891 tons.

The mill ran 96 per cent. of the running time and treated 16,456 tons of ore. The average value of ore treated was \$15.46 per ton; approximate extraction was 94.4 per cent., and milling costs \$1.149 per ton.

During the four weeks there was expended on plant \$30,546.34. Profits from January 1st to August 12th amounted to \$1,015,451.07, and of this \$720,000 has been paid out in dividends. In his report Manager Robins says:

"Ten of the new stamps were started in that period, and since then ten more have been started, so that at the present time sixty stamps are working upon Hollinger ore.

"A winze has been started below the 675 ft. level and the next level (800 ft.) should be reached about the end of October. The vein upon the 675 ft. level has opened out to 20 ft. in width and averages \$10.90 over that width. This value is about the average of this portion of No. 1 vein upon the upper levels."

Milling began twenty-six and a half months ago. The first dividend was paid on November 2, 1912. Notwithstanding the strike and the inadequacy of the plant to deal with the mine as it expanded, these results were accomplished to August 12:

Year.	Total Value of Ore Milled.
1912 (6½ months) .....	\$ 970,304.89
1913. ....	2,589,392.76
1914 (8½ months) .....	*1,577,037.21
Total. ....	\$5,136,734.86

Year.	Total of Profits.
1912 (6½ months) .....	\$ 600,664.42
1913. ....	1,628,113.64
1914 (to August 12) .....	1,015,451.07

Total. .... \$3,244,229.13  
\*Estimated.

The gold contents of the tons milled represented 171 per cent. on the capital of the Hollinger Co. The profits represented 108 per cent. on the capital. The dividends paid and chargeable against the operations to August 12 amounted to \$2,250,000, or 75 per cent. on the capital. Over and above that there was the \$981,684.56 at surplus, and ore reserves the worth of which is giving the directors every assurance.

The following table shows a comparison of Hollinger performances during the past three twenty-eight day periods:

	June 17.	July 15.	Aug. 12.
Gross profits .....	\$129,168	\$132,712	\$171,975
Current assets .....	369,025	497,241	514,221
Gold assets .....	270,419	165,872	209,297
Surplus. ....	859,225	901,938	981,135
Working cost .....	63,626	70,637	68,578
Working cost per ton milled. ....	4,578	4,322	4,167
Running time of possi- ble, p.e. ....	90	94	96
Average value . . . . .	\$14.59	\$13.62	\$15.46
Approx. extract, p.e. . .	95.20	91.00	94.04
Ore treated (tons) ....	13,598	16,343	16,456

### PROGRESS IN CALGARY OIL FIELD

According to the "Natural Gas and Oil Record" interest early in September centred around the wells of the Calgary Petroleum Products Co., the Dingman 1 and 2, during the past week. The work of drilling the No. 1 well in deeper started last Saturday. The gas pressure and oil flow increased steadily from the time that work started. Thursday the drill was 30 ft. into the sand when work was stopped. The tubing is being put back into the hole, the owners being satisfied that the well will now be a steady producer. Since the additional depth has been reached the well has repeatedly gushed over the crown block. Regular daily shipments of ore are now being made from the Dingman property. The oil is being sold principally for use in traction engines in the harvest fields and the farmers claim that the oil gives better satisfaction than any gasoline that they can buy. Shipments now are about eight barrels a day, but this will be increased just as soon as the proper facilities for handling can be arranged. Drilling has been resumed at the No. 2 well, where the oil showings are the equal of the No. 1 well at the same depth.

The Sweetgrass district continues to attract a great deal of attention. The Segur Sweetgrass well has now passed the six hundred ft. mark and many other companies are preparing to enter that territory. The Beaver Oil Co. is sending a Star drilling outfit in to test its properties, and the Standard Oil Fields Co. has acquired holdings in the district. E. P. Howard has closed negotiations for a large tract of land for a party of Chicago capitalists.

Drilling has been resumed at the United after a week's delay while fishing for lost tools. This well is down 2,445 ft. and is nearing the oil bearing sands. The Southern Alberta well is down 2,200 ft., and the showings are said to be excellent. There have been oil



showings for the last 200 ft. Oil seepage was found in the Passiac well last week at a depth of 1,000 ft. The flow of gas at the Monarch well has been increasing steadily for the past few days. This well is now down more than 3,200 ft.

The Calgary Alberta Co. spudded in early in the week in Township 17, Range 3, West of the 5th. The Consolidated well No. 2 has now passed the 1,000 ft. mark. The Western Pacific well struck a heavy flow of gas at 900 ft. Work at both the Alberta Petroleum and Prudential wells progressed rapidly during the week, and the showings in both wells are more favorable than at any other time. The Federal is again drilling and is now 1,050 ft.

## MOTHER LODE AND SUNSET MINES

Memoir 19, being No. 26 of the Geological Series of the Geological Survey Branch of the Canada Department of Mines, has been distributed. This memoir has been prepared by O. E. Leroy. It is a report devoted to a description of the geological relations of the ore deposits of the Mother Lode, Sunset, and adjacent mining properties at Deadwood, Boundary district of British Columbia, and is an extension of similar work previously done at Phoenix and vicinity in 1908. (See Memoir No. 21, *Geology and Ore Deposits of Phoenix*, by O. E. Leroy, Geol. Survey of Canada).

It is one of the unfortunate exigencies of the preparation and publication of reports of this nature that at times several years elapse between the time the field work is done and that at which the report is made available to the public. In this instance it is shown on the Economic Geology and Topography map sheets accompanying the report that in 1910 the economic geology was investigated by O. E. Leroy, the areal geology by C. W. Drysdale, and the topography by W. H. Boyd and assistants. In mentioning this it is with the idea of expressing regret that conditions appear to have necessitated a delay of nearly four years between the completion of the field work and the time at which the report was printed and distributed, rather than to make any complaint on this score.

The introductory general statement follows:

"The Boundary for the last eleven years has been the most important copper producing district in British Columbia and for several years has held the leading position among the copper producing centres of Canada. In the first decade (1900 to 1909) the copper content in the ores mined amounted to 247,995,303 lb., [Total to end of 1913 is 363,671,849 lb.—Ed.] the metal also containing important amounts of gold and silver as by-products. The production in 1910 amounted to 31,354,985 lb. of copper based on smelter returns.

"The principal mines which are producing the typical low-grade and almost self-fluxing copper ores in the Boundary district are the Knob Hill-Ironside, Gold Drop, Rawhide, Snowshoe, Monarch and War Eagle, situated at Phoenix; the Oro Denoro and Emma, at Summit; and the Mother Lode, at Deadwood, near Greenwood. The controlling companies operating the above-mentioned mines are the Granby Consolidated Mining, Smelting & Power Co., Ltd.; the Consolidated Mining and Smelting Company, of Canada, Ltd.; and the British Columbia Copper Co., Ltd.

Other abstracts from the report give the following information:

**Field Work.**—The area mapped is about two-thirds of a square mile in extent and includes the Mother Lode, Sunset, Crown Silver, and Marguerite mines. The map is published on a scale of 400 ft. to an inch with a contour interval of 20 ft.

**Situation.**—Deadwood camp, with the Mother Lode mine as an arbitrary centre, is about  $3\frac{1}{2}$  miles by rail from Greenwood, and is about 3,450 ft. above sea level. It is approximately 12 miles north of the International boundary, and six miles from Phoenix, where the other more important mines are situated. Greenwood, 117.3 miles by rail from Nelson, is situated on the southern line of the Canadian Pacific railway, which leaves the main trans-continental line at Dunmore Junction, and which is now being extended to Vancouver through southern British Columbia.

**History.**—Gold was first discovered in Boundary creek, and placers were worked as early as 1862. During the interval between 1862 and 1891 little attention was paid to the district, and but few mineral claims were located. In 1890, the Rossland gold-copper deposits were discovered, and this apparently stimulated prospecting over a wide area in southern British Columbia. During the following year prospecting was actively carried on at Deadwood, Phoenix, and other neighboring mineralized areas in the district. The prospectors came into the country by way of Marcus in the State of Washington. A pack trail followed the Kettle River valley and connected with the Dewdney trail at Grand Forks. From it branch trails were built into the several camps by the prospectors. In Deadwood camp the Mother Lode was located on May 23, 1891, by William McCormick and Richard Thompson; the Sunset on June 2 by John East; and the Crown Silver on the same day by William Ingram. These claims were located under the old law which allowed claims to be 600 by 1,500 ft. with extralateral rights. This act was repealed in 1892 when the present law was established allowing claims 1,500 ft. square with vertical side lines. Practically the whole area in the vicinity of the above-mentioned claims was staked during the subsequent years. In the first few years similar disappointments were experienced by the prospectors to those at Phoenix. The ores were found to be of a very low grade, though the orebodies were apparently of large size. The self-fluxing qualities of the ore were only discovered at a later period when subjected to metallurgical tests.

The history of Deadwood hinges altogether on that of its premier mine, the Mother Lode. It was bonded in June, 1896, by Col. John Weir, of New York, and in 1898 became the property of the British Columbia Copper Co. Extensive developments were planned and carried out, preparations were made for the construction of a smelter at Anaconda—which adjoins Greenwood to the south—and a spur was built from the Columbia & Western railway at Greenwood to the mine. The latter was completed in 1900 and the first furnace of the smelter was blown in early in the following year. Since then the company has gradually expanded, both by increasing its holdings of mining properties and by enlarging its smelting and converting plant which is now capable of treating about 2,400 tons of ore a day. The Sunset and Crown Silver mines were sold in 1897, and after passing through the hands of several companies, a reorganization was effected in 1909 whereby the holding company, known as the New Dominion Copper Co., passed under the control of the British Columbia Copper Co.



The total production of the mines at Deadwood up to the end of 1910 is probably not less than 2,114,481 tons of ore, though exact figures are not available. Of this amount 2,014,481 tons is to be credited to the Mother Lode mine.

**Bibliography**—The concluding part of the first chapter gives a very brief account of geological work previously done, and a list of reports and papers bearing directly on the geology of Boundary district, and on the mining and smelting industries at Deadwood and Anaconda.

**Character of District**—The second chapter is a summary of the general character of the district—regional and local topography, and climate and flora.

**General Geology**—First a general description of the formations is given in the third chapter, and then a detailed description. Under the head of Palaeozoic are discussed the Knob Hill group of rocks, the Brooklyn formation and quartz porphyry; under Mesozoic, igneous rocks—the granodiorite group and hornblende porphyry—are dealt with; under Tertiary, igneous rocks are further considered, the lithology of the olivine basalt, augite porphyry, monzonite porphyry, and pulaskite porphyry each having due notice. In chapter IV, Economic Geology, the distribution of the ores in the mineralized zone, geological relations, character of the ore bodies and particulars of the ore precede observations on the mineralogy, first of the metallic minerals and then of the non-metallic. The metallic minerals include chalcopyrite, iron pyrite, magnetite, limonite, and malachite; the non-metallic minerals embrace actinolite, tremolite, garnet, epidote, zoisite, chlorite, calcite, and quartz. The last section of this chapter shows the origin of the orebodies.

Chapter V is devoted to a detailed description of the mines—the Mother Lode, Sunset, Crown Silver, and Marguerite—in the cases of the larger mines—of location, production, development and equipment, methods of mining, geological relations and character of the orebodies and ores.

Several half-tone reproductions of photographs and sketches, maps, etc., illustrate the text, while an index facilitates reference to the various parts of the report.

## FIRST AID AMONG METAL MINERS IN BRITISH COLUMBIA

At a meeting of the Western Branch of the Canadian Mining Institute held at Nelson, British Columbia, about the end of last May, Mr. Dudley Michel, of the Provincial Department of Mines, instructor in "First Aid to the Injured," delivered his first public address following his appointment in the capacity just mentioned. After having dealt with various phases of this important subject he said:

"Therefore, from the economic as well as the humanitarian side of the subject, every mine manager should be vitally interested in the conservation of the limbs and lives of his employees. The slogan of the progressive mine manager of to-day is 'Safety First,' and he who fails to get into the movement must soon drop out of the race.

"The Hon. the Minister of Mines, Sir Richard McBride, and the department over which he presides, realizing that the metalliferous mining field of this Province offers many opportunities for the formation of first aid centres, have decided to do some missionary work in it, and I have been honored in having been appointed an instructor and organizer in first aid work, and

in that connection I expect to visit all of the mines you have charge of.

"Realizing though that nothing can be successfully done in this movement without the earnest co-operation of each mine manager, his under officials, the mine doctors and the employees themselves, I respectfully solicit your kind assistance in this work. Uniformity is essential. To obtain this it has been deemed advisable to co-operate with the St. John Ambulance Association, this organization having local centres established in the chief cities, railway centres and most of the large coal mining camps throughout the Province. The syllabus and examination course of this association are alike wherever its classes are held, and the St. John Ambulance first aid certificates granted to those who pass its examinations are good all over the British Empire. It will thus be readily seen that a certificate from this association has far greater value than one obtained from any local organization, so is much more to be desired by the student in first aid work.

"I expect to commence my work in Rossland camp, and go thence to the Boundary district, going to as many mines as shall be practicable, and I shall greatly appreciate your valued assistance in the preliminary work of organization, and enlistment of the co-operation of the doctors in your respective communities."

Several managers of mines employing many men gave Mr. Michel assurance that they would do all in their power to assist him in carrying out the work outlined, and later they did much to facilitate the organization of first aid instruction classes and so arranging work that their men could attend one or other of the classes without inconvenience. At Rossland, Mr. M. E. Purcell, superintendent of the Consolidated Mining and Smelting Co.'s Centre Star-War Eagle group of mines, and Mr. Ernest Levy, manager for the Le Roi No. 2, Ltd., actively encouraged the first aid movement, while two resident doctors gave gratuitous instruction to the classes that were formed. In Boundary district, too, there was cordial co-operation on the part of mine officials of the Granby Consolidated Co. at Phoenix and of the British Columbia Copper Co. at the Mother Lode mine near Greenwood, also of the mine doctors. In order to encourage their employees to take the first aid instruction course, the mining companies supplied those attending the classes with the St. John Ambulance Association First Aid text book and other requisites without charge. The response on the part of the miners and other employees was very gratifying, there having been fully 200 men in the classes formed in Rossland and at the Boundary mines. Others were formed afterward—at the Consolidated Co.'s Silver King mine near Nelson; the Molly Gibson mine on Kokanee creek, about 25 miles from Nelson; in Ainsworth camp for men employed at No. 1, Silver Hoard, Highland and Maestro mines, and at Riondel, on the opposite side of Kootenay lake, for employees at the Bluebell mines and mill, where Mr. S. S. Fowler, general manager for the New Canadian Metal Co., arranged for the attendance of a doctor to lecture to the instruction class. The total number of men who joined the classes from the time Mr. Michel commenced work at Rossland was about 420.

Mr. Michel planned to visit Slokan mines, and some at Sheep creek, in the southern part of Nelson mining division, but at the time of writing it is not known to what extent he was successful in forming classes there, and securing the attendance of the miners at them. However, there seemed good reason to expect similar interest being taken in the first aid work in these districts, so that it is very likely its desirability and usefulness was re-



cognized there as in Rossland and the other parts where it had been taken up with enthusiasm. The closing of a number of mines has to some extent interrupted progress, yet sufficient advancement has been made to ensure that when conditions are again normal and men employed in the mines in as large numbers as before the European war caused suspension of operations in some of the mining camps, classes will be resumed and more men be instructed in first aid work.

The Chief Inspector of Mines, Mr. Thomas Graham, of Victoria, is much gratified with the generally good results that have followed the formation of first aid classes at metalliferous mines. The work was undertaken by the Provincial Department of Mines on his strong recommendation, and it having been successful in large degree, there is little doubt that the Hon. the Minister of Mines will readily sanction its continuance next year, and extension to all operating metal mines in British Columbia wherever it shall be found practicable.

### THE CAVING SYSTEM IN THE LAKE SUPERIOR DISTRICT

J. Parke Channing, the well known consulting mining engineer, in his paper prepared for the present meeting of the Lake Superior Mining Institute, discusses the introduction of the caving system on the Marquette range, and where the credit for the innovation should go. It follows:

"The recent statement by me that the late Mr. Joseph Sellwood was responsible for the introduction of the caving system of mining in the Lake Superior mines, has called forth criticism as to the accuracy of my statement, and it is claimed that this method was first used at the Cleveland Hematite mine, which was a soft ore property lying about half way between Ishpeming and Negaunee.

"In 1886, when I went to the Gogebic Range for the first time, the Brotherton mine, near the village of Wakefield, was being operated by Mr. Joseph Sellwood. He had for the superintendent the late Mr. John Pengilly, who had as his two foremen Mr. John Harris and Mr. Thomas R. Hocking. The mine was wrought on the sub-level system of caving, which I fully described with illustrations in an article entitled Lake Superior Iron Ore, published in volume III. of the Mining Industry, being for the year 1894. Later on when Mr. Sellwood took charge of the Chandler mine on the Vermilion range he transferred Mr. Pengilly to that property, and this mine was wrought on a similar system.

"In 1890 I left the Gogebic Range and went to Ishpeming, Michigan, to take charge of the East New York mine, and took with me for mine foreman Mr. Hocking, who had, up to that time, continued as one of the foremen at the Brotherton mine. We changed the method of mining at the East New York from square sets to caving, and at the same time Mr. Thomas F. Cole, who was in charge of the Queen group of mines at Negaunee, introduced this system at his mines with great success and economy. After coming to reside in Ishpeming I visited all the mines in the district, among them the Cleveland Hematite, and I am quite sure that the caving system was not in use at that time.

"I have been told that Mr. George R. Wallace, afterward manager of the Fayal mine on the Mesaba range, introduced the caving system at the Cleveland Hematite at the suggestion of two north of England miners, who had been accustomed to its use at home. If this is so, evidently the experiment was not considered a success,

or else at the time of my residence in Ishpeming it would have been in use at the Cleveland Hematite.

"It is a well known psychological fact that similar problems are often solved in an identical manner by men who have had no communication with each other. It is said that Wallace was at work on the Origin of Species at the same time as Darwin, and it is interesting to note that Mr. Guy R. Johnson introduced a sub-drift of mining at Longdale, Va., at the Longdale mine, which was almost identical to that of the Brotherton. This method he described in a paper on page 96, volume xx. of the Transactions of the American Institute of Mining Engineers for the year 1891, under the title of 'Methods of Working and Surveying the Mines of the Longdale Iron Company, Virginia.' Mr. Johnson, himself, told me many years ago that he had never heard of the Brotherton use of this system, and, if my memory serves me right, he also said that he had not known of it as the North of England system of mining, but that he and his staff worked it out as the best solution of the problem presented them.

"Time is passing and a new generation of mining men are coming in. The Lake Superior Mining Institute is becoming a record of the history of Lake Superior, and I, as one of its charter members, would welcome any information on this interesting question. Most new inventions and discoveries are 95 per cent. past experience of others and 5 per cent. novelty. He who adds but a little to the world's efficiency deserves credit, and I would be the last one to hold it from him."

### McGILL GRADUATES AND THE WAR SITUATION

The following letter has been sent to every McGill graduate:

At a time like the present, when the destiny of the Empire is at stake, McGill University and its graduates should come forward and do everything in their power to help the common cause. The individual graduate probably does not fully realize the influence the graduates as a whole have in Canadian affairs. Over 5,000 educated men, holding important positions all over the Dominion and elsewhere, are a tremendous power and influence, particularly if their efforts are concentrated on certain fixed objects.

It was felt by the Executive of the Graduates' Society and by the committee in charge of the reunion, which it had been proposed to hold in the fall of 1915, that in the present crisis in the Empire, something should be done; and it was decided to write a letter to every graduate asking him to use all his influence towards patriotic ends.

In order to make our influence felt in a definite way, it was thought that a fund should be started to which every graduate of the University would contribute. The contribution of each individual would be for the nominal amount of one dollar, which would represent his patriotic vote and the signification of his intention to do everything possible to assist Canada in the responsibility and duty created by the war.

The vote of the McGill graduates will be deposited in cash form to the credit of the Canadian National Patriotic Fund.

You are therefore invited to fill in and return the accompanying check form, which will be cashed at par, or to enclose one dollar in some other form.



An immediate response is necessary if this action is to have all the effect that is hoped for from it.

For the Executive,

JOHN L. TODD, President.

WILLIAM STEWART, Secretary.

Remittances should be addressed to Mr. George C. McDonald, 179 St. James Street, Montreal.

A splendid response to the appeal has already been received, and the subscriptions are coming in very rapidly. Letters from Sir Wilfred Laurier, Hon. Mr. Doherty, Minister of Justice, Chief Justice Sir Charles Davidson, Dr. F. D. Adams and many other prominent McGill graduates have been received, heartily approving of the movement.

## THE CANADIAN COPPER COMPANY'S DEPARTMENT OF SAFETY \*

By E. T. Corkill, Safety Engineer.

In July, 1913, the Canadian Copper Co. organized a Department of Safety, for the purpose of accident prevention. The work of this department is largely in charge of the safety engineer, working in conjunction with the Central Safety Committee. This committee consists of the following: President, Vice-President, General Superintendent, Superintendent of Mines, Smelter Superintendent, Chief Physician and Safety Engineer.

The general superintendent is chairman of the committee, and the safety engineer secretary. Meetings are held during the first week of each month for consideration of the monthly accident report of the safety engineer, and recommendations brought forward for accident prevention. At these meetings the accidents occurring during the month preceding are discussed, and ways and means devised for the prevention of similar accidents wherever this is possible.

In addition to this Central Committee, Workmen's Safety Committees have been formed throughout the different departments. These committees consist of from five to seven men, depending on the size of the department, and meet every two weeks. The safety engineer meets with these committees and keeps a record of all their recommendations, advising them at a subsequent meeting as to the disposition of these recommendations. Since the organization of these committees many recommendations have been received and fully 90 per cent. have been carried out. The work of these committees from the smelter, mechanical and transportation departments has been exceptionally good. The mines committees have not been so successful, owing to the preponderance of foreign labor. The duty of each committee is to take note of defects in machinery, buildings, methods of working or handling material, or of any conditions throughout the work which may be the cause of accidents to employees. Each member of committee is allowed the necessary time from his work to attend these meetings, and if he is on another shift he is allowed three hours time for attending.

Reports are made out by the doctor for every accident case he attends, giving date, nature of accident and probable period of disablement. This report is forwarded to the safety engineer. A notice is also sent by the doctor when the man is able to resume work, and a card also filled out and given to the in-

jured person to be presented to foreman or timekeeper, giving the date the man is allowed to resume work.

A foreman's report is also made out and forwarded to the safety engineer, giving full particulars of each accident. In this manner a full and complete record is obtained of all accidents that necessitate a workman laying off work.

As an encouragement to the men, and to stimulate interest in the safety work, a pennant is awarded to the building at the smelter that has the lowest accident rate for the month. A pennant is also awarded the mine that has the lowest accident rate.

A comparison of the accident rate for the year beginning July 1st, 1913, when the safety department was created, and ending June 30th, 1914, with the corresponding period of the preceding year, shows the following:

Number fatalities per 1,000 men employed—1.98 or decrease of 74.7 per cent.

Serious accidents per 1,000 men employed—18.2 or decrease of 35 per cent.

Minor accidents per 1,000 men employed—69.7 or decrease of 18.3 per cent.

The present system of having a doctor's report made out for every accident insures the reporting of every accident by the foreman to the safety engineer. Before the safety department was formed a large number of minor accidents were not reported. The decrease of 18.3 per cent. in these accidents should, therefore, be much greater.

All the fatal accidents during the year occurred in the mines. The accident decrease in the various departments is as follows:

**Mines Department**—Fatal accidents, 54 per cent. decrease; serious accidents, 31 per cent. decrease; minor accidents, 9 per cent. increase.

**Smelter Department**—Fatal accidents, none, compared with three for preceding year; serious accidents, 44 per cent. decrease; minor accidents, 48 per cent. decrease.

**Mechanical Department**—None, compared with one for preceding year; serious accidents, 49 per cent. decrease; minor accidents, 25 per cent. decrease.

**Transportation Department**—Fatal accidents, none, compared with three for preceding year; serious accidents, 75 per cent. decrease; minor accidents, 80 per cent. decrease.

**Electrical Department**—Fatal accidents, None, compared with one for preceding year; serious accidents, same; minor accidents, 75 per cent. decrease.

The greatest decreases have been in those departments that employ the larger number of English-speaking men. The mines employ about 80 per cent. foreign labor, most of whom cannot speak English. It is, therefore, with great difficulty that any headway is made with these men in the work of accident prevention, and the reduction of accidents in the mines will be correspondingly slow.

## THE COLORADO STRIKE.

President Wilson has submitted a plan for a three years' truce to all parties in the Colorado mining strike, during which the state mining and labor laws shall be enforced, with restoration to employment of all striking miners not found guilty of violation of the laws. Intimidation of non-union or union men is to be prohibited and wage scales are to be posted at each mine. A grievance committee is to be chosen by employees of each mine, entrusted with treating with the employer when trouble arises.

\*From report of T. H. Sutherland, Chief Inspector of Mines of Ontario, July, 1914.



# THE HISTORY OF TUNNELLING\*

By D. W. Brunton and J. A. Davis.

The art of excavating underground passageways has been known to mankind for many centuries. The ancient Egyptians and Hindus employed it in the creation of many wonderful subterranean temples and sepulchers in hard rock, and similar monuments are found in the works of the Hebrews, Greeks, Etruscans, Romans, Aztecs and Peruvians—in fact, of all ancient civilized peoples.

## Egyptian Temples and Tombs.

It is not surprising that the Egyptians, with their wonderful knowledge of quarrying as well as of many other useful arts, should have been versed in methods of underground rock excavation. Remains of their work, some of which dates back to 1500 B.C., may be found in the grottos of Samoun, the tombs near Thebes and Memphis, the catacombs of Alexandria, and the temples of Ipsamboul. A gigantic tomb has been found at Abydos, which was cut in the solid rock during the XIIth dynasty by Senwosri III.; also Rameses II., who is perhaps the best remembered personage of these ancient times, constructed, either because of vanity or the great length of his reign, many rock-cut temples, the grandest of which is probably that of Abu Simbel.

The work was performed with hand tools and the labor necessary to have fashioned monuments of such magnitude and grandeur must have been stupendous. For cutting granite and other hard rock, the workmen used saws of copper, which were either fed with emery powder or were set with teeth of that abrasive. A similar method was employed as early as the fourth dynasty for circular holes, which were drilled by a tube having fixed teeth or fed with emery powder. For removing rock in a quarry or in a tunnel, grooves varying in width from 4 to 20 in. were made on four sides of a block, which was then broken out by the swelling action produced by soaking with water a number of wooden wedges driven into these grooves.

## Hindu Caves and Temples.

The excavations in India probably number at least 1,000, the majority of which are of Buddhist origin. They are usually of two types—chapels and monasteries. The chapels consist of a nave with a vaulted roof, separated from the side aisles by columns, and containing a small chapel at the inner circular end. The monasteries consist of a hall surrounded by a number of cells for the residence of monks and ascetics.

Most of the Indian excavations are of much later date than those in Egypt. The earliest, the Sudama or Nigope cave, was constructed probably about 260 B. C., the Lomas Rishi was built about 200 B.C., and those of Nassick about 129 B. C. These earlier caves imitated very closely contemporaneous timber-roofed temples, and for this reason the columns all slope inward, copying with great fidelity of detail the rafter supports of the wooden temples. In the Karli caves (about 78 B. C.) this feature is absent; the columns of the nave are quite plumb and the perfection of architecture and ornamentation is unsurpassed by any of the later Hindu rock temples. The galleries and rooms of the caves of Ellora contain a total of nearly five miles of subterranean work. Although the builders may possibly have known of gunpowder, it was not used in the construction of these tunnels, which, like

all the preceding works, were accomplished laboriously with hand tools and probably by slave labor. The caves of Salsette belong to the sixth century A. D., whereas those at Elephanta were constructed about 800, and the Gwalior temples were excavated still later, during the fifteenth century.

## Grecian Tunnels and Mines.

Modern archaeological investigation indicates that tunneling was possibly known to the Minyae, an ancient Grecian people dating back beyond 2000 B. C., whose cycle of myths includes, among others, that of the Argonautic expedition. A series of shafts, 16 in all, are to be seen near Lake Kopais, in Boetia, which are supposed to have been constructed by these peoples for the ventilation of an ancient drainage tunnel. The shafts are 200 to 1,000 ft. apart, 6 to 9 ft. wide, and have a maximum depth of 100 ft. The tunnel was probably the enlargement of a natural watercourse, such as are commonly found in similar calcareous rocks. Krates, of Chalkis, a mining engineer who lived in the time of Alexander the Great, is credited historically with an attempt to drain this lake by utilizing and enlarging natural watercourses.

Although the exact date of the introduction of mining into Attica, probably from the Orient, is unknown, it seems to have been subsequent to the time of Solon (about 600 B. C.). By 489 it is certain that the silver mines of Laurium were yielding a highly satisfactory return, and at the instigation of Themistocles the net profits from them were applied by the Athenians to the construction of a fleet, so that these mines no doubt contributed largely to the prosperity and power of Athens. The workings, approximately 2,000 in all, consisted of shafts and galleries in which the rocks were hewn out with hand tools and brought to the surface on the backs of slaves. Air was supplied to the large underground stopes or chambers by ventilating shafts about 6 ft. square and 65 to 400 ft. deep.

Gold was mined in Macedonia and Thrace at least as early as the fifth century B. C., and Herodotus mentions a tunnel in the island of Samos, built in the sixth century, which was 8 by 8 ft. in cross section and nearly a mile long.

## Aztec Mines.

The Aztecs were well acquainted with mining, and they obtained copper from the mountains of Zactolan; the mines of Tasco furnished silver, lead and tin; and the extensive galleries and other traces of their labor were of great assistance to the early Spanish miners. With no knowledge of iron, although iron ore was very abundant, their best tools were made of an excellent substitute in the form of an alloy of copper and tin. With tools of this bronze they could not only carve the hardest metals, but with the aid of powdered silica they could cut the hardest minerals, such as basalt-porphry, and even amethyst and emerald.

## Peruvian Mines.

Although the mines of the ancient Peruvians were little more than caverns excavated in the steep sides of the mountains, nevertheless they knew of the art of tunneling, as is shown by the tunnels of their aqueducts and by the extensive tunnel that they built to drain Lake Coxamareo. They, too, had no knowledge of iron, and their tools were made of an alloy of copper

\*Extract from Bulletin 57, U. S. Bureau of Mines.



and tin, which they probably discovered quite independently of the Aztecs, whom they rivaled also in the cutting of gems.

### Roman Tunnels.

The Romans, however, were undoubtedly the greatest tunnel builders of early history. They drove tunnels for passage, drainage, water supply and mining, not only in Italy, but wherever their conquests led them, as is evidenced both by records and by old workings left behind in the countries they dominated. One hardly needs to mention the numerous aqueduct tunnels and sewers of the ancient city of Rome, some of which are in use to-day, attesting the ability of the Romans in this branch of engineering. Remains of their work, many of them remarkably well preserved, have been found in France, Switzerland, Portugal, Spain, Algiers and even Constantinople.

Their tunnels were of no mean size. A road tunnel near Naples, constructed, according to Strabo, about 36 B. C., was approximately 4,000 ft. long, 30 ft. high and 25 ft. wide. About 359 B. C. Lake Albanus, which lies about 15 miles southeast of Rome, was tapped for its supply of clear water by a tunnel over one mile long 8 ft. high and 5 ft. wide. Possibly the greatest Roman tunnel was driven by the Emperor Claudius to drain the overflow waters from Lake Fucinus, which is situated about 75 miles nearly due east of Rome and has no natural means of outlet. This tunnel, completed in 52 A. D., after 11 years' labor, is over 3 miles long and was designed to be 19 ft. high and 9 ft. wide; but it appeared to have been even larger than this when, in 1862, it was reopened to obtain valuable land beneath the lake.

These works seem all the more marvelous when one considers the primitive methods available at that time. Explosives were unknown and machinery was not then used in mining. Rock openings were usually made by chipping, by channeling and wedging as in Egypt, or by cutting large grooves around the block to be excavated, using hand tools made of iron, copper and bronze, although it is quite possible that for certain classes of stone cutting diamonds or some similarly hard minerals were employed in conjunction with primitive tube drills and saws. These methods were often supplemented by fire setting, a method chiefly employed, however, in the large chambers or stopes and not well adapted for driving small tunnels. It consists simply of heating the rock to a very high temperature and quenching suddenly with water (or sometimes with vinegar in calcareous rocks), producing shattering and disintegration because of sudden contraction. Many writers have described the intense and fearful sufferings of men engaged in this work, usually slaves and prisoners of war, who perished by the thousands—a fact, however, of little concern to the ancient builders.

The value of Spain as a storehouse of precious metals, offsetting somewhat the influence of eastern wealth, was well appreciated by Roman leaders, and an armed force for the protection of the mines was maintained there constantly, in many cases at the cost of serious political and financial embarrassment at home. In southern Spain, where the numerous silver and copper mines contained much water, Roman tunnels are very common. They are remarkable for their small size, being usually about 5 ft. in height and, where timbered, 16½ to 36 in. in width. One adit, as far as explored, has a length of 1,850 ft. and a maximum depth of 183 ft., and another is 2,300 ft. long and has a maximum depth of 215 ft.

As nearly as can be ascertained to-day from discoveries in them of various objects of interest, including coins, it is certain that these adits must have been driven very early in the Christian era. Toward the latter end of the period in which these particular tunnels were used by the Romans attempts were made to work the orebodies below them by raising water from the lower stopes by means of slave-operated water wheels.

As artificial ventilation by means of blowers was at that time unknown, like most of the Roman tunnels these were ventilated by shafts which were spaced in the tunnel mentioned above at about 25 meter intervals; in order also to minimize the depth to which the shafts were sunk, the courses of the tunnels corresponded very nearly to those of the valleys or gulches above them instead of being straight, as is the usual modern practice. Like the adits, the ventilating shafts were remarkably small. Where timbered the adits were usually about 2 ft. 10 in. square in the clear, and where the rock would stand without timbering they were circular and generally did not vary much from 2 ft. 4 in. in diameter.

### Tunneling in Europe During the Middle Ages.

With the fall of the Western Empire, tunnel work in Europe practically ceased for many centuries. Some excavations were made, it is true, for tombs and the crypts of monasteries and underground passages to a secluded exit for escape in time of defeat were a necessary part of the equipment of each castle. Crude attempts at mining also were practised in Germany. The Teutonic tribes, whose main occupation was warfare and who were barbarous and essentially nomadic at the time of the conquests of Julius Caesar, probably learned from the Romans the value of gold; later they began to search for precious metals and to pursue other peaceful occupations.

During the Middle Ages tunneling was devoted almost exclusively to the needs of war and was seldom employed in constructing aqueducts or other public works. There is, however, a record of a road tunnel begun in 1450 by Anne of Lusignan. It was intended to pierce the Alps at an elevation of nearly 6,000 ft. and afford better means of communication between Nice and Genoa, but was never completed. Work was subsequently resumed in 1782 by Victor Amadens III., but was finally abandoned 12 years later after a total of nearly 8,000 ft. of tunnel had been constructed.

### Development of the Use of Gunpowder in Tunneling.

Although gunpowder in Europe, according to the consensus of opinion, was probably invented early in the fourteenth century, and by the end of the sixteenth century was commonly used in military operations for gunnery and for blowing up fortifications, it was not applied directly to mining or tunnel operations during this period. Agricola's "Bergwerck Buch," the third edition of "De Re Metallica," published by Basel in 1621, a complete English translation of which has been issued, pictures Roman methods and hand work and fire setting as the usual means of mining.

In the year 1613 Martin Weigel is said to have introduced gunpowder in mining. Gatschmann at this time describes the use of wooden plugs for stemming. The plugs were later (about 1685) supplanted by clay. August Bayer ("Das gesegnete Markgrafenthum Meissen," 1732) and Henning Calvor ("Nachrichten uber das Bergund Maschinewesen am Harze, etc.") also confirm the date of 1613 as that of the invention of drilling and blasting, but Honemann and Rossler make it 15 or 20 years later. Whatever may have been the date when



blasts were first fired in mines, it is certain that blasting had become fairly common in 1650, for powder is mentioned as having been purchased for the Harz mines as early as 1634, drill holes are reported at Dullen which bear the date of 1637, and blasting is known to have been introduced into the Freiberg district in 1643.

The use of gunpowder gave a new impetus to mining and a large number of men became skillful in overcoming the difficulties of underground drifting, so that it is not surprising to note that an increased number of tunnels for other purposes were begun soon after. The chief of these purposes was transportation, and in the eighteenth and early part of the nineteenth centuries many tunnels were driven for canals which, aside from wagon roads, were the only highways at that time. Later the development of steam railroads and the desirability of maintaining level gradients led to the building of a still greater number of tunnels. A brief summary of the features of the more important transportation tunnels constructed abroad and at home follows.

### Canal Tunnels.

The first modern tunnel constructed for commercial transportation was the Malpas tunnel on the Langguedoc Canal in France. It was 515 ft. long, 22 ft. wide and 27 ft. high, and was built between 1679 and 1681, by Riquet, a French engineer. Although it showed that canals could be constructed through country before thought impassable, no more canal tunnels were driven in France until nearly a hundred years later, the Rive de Gier Tunnel (1,656 ft. long) being constructed on the Givors canal in 1770, and the Torcy tunnel (3,970 ft. long) on the Centre canal in 1787. The Tronquoy and the Riqueval Tunnels on the St. Quentin canal were started in 1803, and the Noireu tunnel (approximately 39,400 ft. in length) on the same canal was begun in 1822. On the Bourgoyne canal, the St. Aignan tunnel was started in 1824, so that by the middle of the nineteenth century nearly 20 canal tunnels, with a total length of nearly 93,500 ft., had been constructed in France.

The earliest transportation tunnel in England was the Harecastle, on the Grand Trunk canal, which was begun in 1766 and opened for traffic in 1777. This tunnel was 8,640 ft. in length, 9 ft. wide and 12 ft. high. There were originally four other shorter tunnels on this canal. The Harecastle tunnel was found to be too small to accommodate traffic, and was replaced in 1824 by a parallel tunnel which was 16 ft. high and 14 ft. wide, 4 ft. 9 in. of the width being used for a towpath. The Sapperton tunnel on the Thames-Medway canal was started in 1783. It was approximately 12,500 ft. long and its construction took six years. The next large canal tunnel in England was the Blisworth (9,250 ft. long), on the Grand Junction canal. It was started in 1798 and required seven years for its completion. In 1856 there were over 45 tunnels on the various English canals, aggregating some 220,000 ft. in length.

The first canal tunnel in the United States was the Auburn tunnel at the Orwisburg landing on the Schuylkill Navigation canal. The tunnel (which was 450 ft. long, 20 ft. wide and 18 ft. high) was begun in 1818 and opened for traffic in 1821. The hill it pierced is composed of red shale, and the highest point was only 40 ft. above the top of the tunnel. The tunnel was shortened in 1834-37 and again in 1845-46, and was finally made an open cut in 1855-56. The "Summit Level," or Lebanon tunnel, on the Union canal, begun in 1824 and finished in 1826, was the second canal tunnel

in this country. It was originally 720 ft. long, 18 ft. wide and 15 ft. high, being driven through argillaceous slate at a total cost of \$30,464. It was followed by the "Cone-maugh" and "Grants Hill" tunnels, on the western division of the Pennsylvania canal (1827-30); the Paw-paw tunnel, on the Chesapeake and Ohio canal (1836); and two tunnels on the Sandy and Beaver canal, Ohio (1836-38).

### Railway Tunnels.

The first railroad tunnel of which the authors have record was the Terre-noire tunnel, near St. Etienne, France, on the Roanne-Andrezieux horse railroad. This tunnel, which was begun in 1826, was 4,920 ft. long, 9.8 ft. wide and 16.4 ft. high. Some 14 other tunnels were built on the road from St. Etienne to Lyons between 1826 and 1833. The first tunnels on a railroad using steam locomotives were those on the Liverpool and Manchester Railway, constructed between 1826 and 1830. It was on this road that the famous trial between the "Rocket," "Novelty" and "Sans Pareil" locomotives took place in 1829. The following summary of early railroad tunnel building in Europe is quoted from Drinker's work on tunneling:

Tunnels, of course, multiplied rapidly in England with the extension of railways, and during the 12 or 15 years following the construction of the Liverpool and Manchester line there were a large number of tunnels built throughout the Kingdom, among them being the famous Kilsby, Box and Woodhead tunnels. The first tunnels on a steam railway in France were those built on the St. Germain line in 1837. Subsequently the ones on the Versailles, the Gard, and the Rouen lines raised the total length of tunnels in France in 1845 to 12,833 meters (42,105 ft.). The report of the Corps des Ponts et Chaussées on tunnels for 1856 shows at that date a total on French railroads of 126 tunnels, of a total length of 65,106 meters. Among the noted early French tunnels may be cited the Nerthe, Arschwiller, Rilly, La Motte, Lormont and Alouette. In Belgium the Cump-tieh tunnel, built in 1835, on the Chemin de l'Etat, seems to have been the earliest. In Germany (Prussia and other States) the earlier lines were so located as to not require much tunnel work; and the Oberau tunnel (1839), on the Leipzig-Dresden line, in Saxony, was the first. In Austria Rziha gives the Gumpoldskirch tunnel as the first. A tunnel at Eriebitz (perhaps the same), on the North line, is mentioned in the Ponts et Chaussées report (above cited) as an early Austrian one. In 1856 there were some 50 tunnels in Austria, of a total length of 13,522 meters. In Italy the Naples-Castelamare line, opened in 1840, had several tunnels. In 1856 the total Italian tunnels amounted to 10,181 meters. The Boloina-Pistoja line is especially remarkable for its semisubterranean character. Among the early Swiss tunnels especially to be noted is the Hauenstein, commenced in 1853 and finished in 1858.

The first railway tunnel in the United States was constructed between 1831 and 1833 on the Allegheny Portage Railroad in Pennsylvania. The tunnel (which was driven through slate) was 901 ft. long, 25 ft. wide by 21 ft. high, and was lined throughout with masonry 18 in. thick. It was followed by the Black Rock tunnel (1835-37) on the Philadelphia and Reading Railroad and the Elizabethtown tunnel (1835-38) on what is now the Pennsylvania Railroad. After this time railroad tunnel construction became so general that by 1850 as many as 48 tunnels had been completed on American railways.

### Mine Tunnels.

Among the early European mining tunnels driven with gunpowder and hand drilling mention should be



made of the Deep George and the Rothschoberger Stollen in Saxony, the Joseph II. adit at Schemnitz, Hungary, and the Ernest August Stollen, which was later driven under the Deep George. Several tunnels, of which the Taillades tunnel was the most important, were also driven in connection with the Marseilles Aqueduct during this period.

The Deep George Stollen was driven between 1777 and 1799. The total length of the main tunnel is 34,529 ft. Its various branches aggregate 25,319 ft. more, and yet this immense undertaking, driven entirely by hand, was to obtain a drainage depth of only 460 ft. It passed through graywacke for nearly the entire distance.

Work began in the Joseph II. mining adit, at Schemnitz, Hungary, in 1782, but owing to various interruptions the tunnel was not completed until 1878. The portal is at Wornitz, on the left bank of the River Gran, about 10 miles west of Schemnitz. The tunnel is 10.27 miles long, 9 ft. 10 in. high and 5 ft. 3 in. wide, and cost \$4,860,000. It is used entirely for mine drainage, and the annual saving in pumping amounts to more than \$75,000.

The Rothschoberger Stollen was driven to drain the mines of Freiberg, Saxony; it was begun in 1844 and completed April 12, 1877. The tunnel starts in the Triebisch valley, at Rothschoberg, about 12 kilometers above Meissen, on the Elbe. Its length on the line planned to Halsbrücke was 42,662 ft., but as completed to a connection with the Himmelfahrt mine was, including branches, 95,149 ft. The depth below the Anna Stollen was 308 ft. Hand drilling and black powder were used to the end of 1875, when Burleigh drills were introduced. The work was carried on by the State. The tunnel was 9 ft. square and was driven from 18 headings, yet 33 years were required for its completion, the average rate of progress in each of the headings being only about 15 ft. per month.

The Ernest August tunnel was driven below the Deep George Stollen in 1851-1864. The main tunnel is about 34,218 ft. long, but the entire length of the adit and its branches is 74,452 ft., all driven in rock similar to that in the George Stollen. The tunnel is 11 ft. high and 5½ ft. wide, and is driven on a grade of 35.6 ft. to the mile. Hand drilling and black powder were used, and with 7-hour shifts, the rate of progress was 50 ft. per month; 4-hour shifts increased the rate of progress to 78.7 ft. per month, and by crowding the miners to the limit the progress during the last three weeks was 75 ft., or at the rate of 107 ft. per month.

Some idea of the importance the early German miners attached to drainage may be gathered from the fact that this colossal enterprise gave them an increased drainage depth of only 315 ft.

The Taillados tunnel on the Marseilles Aqueduct was begun in January, 1839, and completed at the close of 1864. It was driven from 14 shafts, and in their construction so much water was encountered that the work of sinking was difficult and at times seemed almost impossible. It was finally necessary to place at one of the shafts a steam engine of 100 horse power in order to remove the water, which amounted to 3,300 gallons per hour. The cost of sinking the shafts was approximately \$40.00 per ft., and the tunnel itself cost approximately \$37 per ft., or, including the cost of the shafts, \$48.50 per ft. The Assassin tunnel on the same project was somewhat less difficult to drive and cost only \$25.50 per ft. for 11,400 ft., whereas the Notre Dame tunnel, which was lined with masonry for its entire length of 11,500 ft., cost \$32.50 per ft.

The first large mining tunnel in the United States was begun as early as 1824. This was the "Hacklebernie" tunnel, near Mauch Chunk, Pa.; it was driven by hand, and black powder was used. When work stopped in 1827 an opening 16 ft. wide by 8 ft. high had penetrated 790 ft. through hard conglomerate. Work was resumed in 1846, and the tunnel was extended to a length of 2,000 ft.

### Development of the Use of Rock Drills and High Explosives in Tunneling.

The invention of drilling machines, which occurred almost simultaneously with the discovery of high explosives, gave another great impulse to tunnel driving. The following table gives in Chronological order some of the more important events connected with these two wonderful improvements.

1847—Sobrero discovered nitroglycerin.

1849—J. J. Couch, of Philadelphia, patented on March 29 the first percussion rock drill.

1851—J. W. Fowle, of Philadelphia, patented on March 11 the first direct-action percussion drill.

1854—Schumann invented his percussion drill at Freiberg.

1857—Schumann drills used in Freiberg mines.

1857—Sommeiller invented a rock drill for use at Mount Ceniz.

1861—January 1 Sommeiller improved drills commenced work in the Mount Ceniz tunnel.

1863—Nobel first applied nitroglycerin as a blasting agent.

1865—Guncotton tried at the Hoosac tunnel by Thos. Doane, chief engineer.

1866.—Nitroglycerin tried with great success at the Hoosac tunnel by T. P. Shaffner.

1866—Burleigh drills tried and proved to be a great success at the Hoosac tunnel.

1867—Nobel invented dynamite.

1868—Dynamite patented in America by Nobel.

The first extensive utilization of these aids was in the construction of the Mount Ceniz tunnel in Europe and the Hoosac and Sutro tunnels in this country. The success attained with them soon led to further activity in tunneling, not only for railroads but in connection with mining, drainage and water supply as well—an activity culminating in the immense amount of such work undertaken within the last 10 or 15 years.

### The Sutro Tunnel.

The idea of draining the mines of Virginia City by a deep tunnel was first broached in the spring of 1860, when Mr. Adolph Sutro began negotiations with the mines, the State, and finally with the Federal Government for contracts, concessions, etc. Actual work first began at the portal of the tunnel in Carson valley, 3½ miles from Dayton, on October 19, 1869. The work was carried on by hand until September, 1872, when diamond drilling was begun and tried rather unsuccessfully. In 1874 Burleigh drills were introduced, operated by compressed air generated in a compressor made by the Societe John Cockerill, of Seraing, Belgium. The tunnel was completed July 18, 1878, when the Savage vein was cut 20,000 ft. from the portal and 1,922 ft. below its outcrop. The tunnel inside of the timbers was 10 ft. high by 14 ft. wide, divided into two passageways by a central row of posts. The rate of progress varied greatly, ranging from 19 to 417 ft. per month, the average monthly rate from start to finish being 192.3 ft.



**The Tequixquac Tunnel.**

The Tequixquac tunnel, which now forms the most important link in the drainage system of the Valley of Mexico, was begun during the reign of the Emperor Maximilian. The work was stopped, however, at the fall of the Empire and was not resumed until 1885; even then the want of funds prevented any material progress until March, 1888.

This tunnel is  $6\frac{1}{4}$  miles in length, driven through a mass of sand, mud and soft calcareous sandstone. It is brick lined throughout, the section is ovoid, with an extreme width of 13 ft. 9 in. and a height of 14 ft., and the tunnel has a gradient of 1 ft. in 1,388. The calculated flow of water is 450 ft. per second, or 200,000 gal. per minute. At first the headings were driven in the centre, but the bottom heading system was soon adopted of necessity. The greatest completed tunnel advance in any one month was 182 ft., and the greatest distance that any single heading was driven in a calendar month was 656 ft.

**The Shoshone Tunnel.**

The Shoshone tunnel, 1906-1910, is owned by the Central Colorado Power Co. Its intake portal is on the Grand River 12 miles above Glenwood Springs. The tunnel is 12,453 ft. long, 12 ft. high and 16 ft. 8 in. wide, and is driven wholly through hard metamorphic granite.

Where timber supports were necessary vertical posts and a three-piece arch were employed, all of which were afterwards completely covered by concrete lining. Driving was carried on from seven crosscut adits, as well as from both the intake and the discharge ends.

The cost of the tunnel, not including concrete lining, \$927,653, was divided as follows:

**Construction Costs of Shoshone Tunnel per Linear Foot of Tunnel.**

Test drifts .....	\$0.45
Drilling and blasting .....	20.66
Trenching and grading floor .....	1.15
Track work .....	1.76
Mucking and loading .....	17.28
Hauling. . . . .	2.88
Dumping and maintenance .....	2.18
Blasting supplies .....	8.35
Drill steel .....	2.91
Sharpening and repairing .....	4.60
Timbering, temporary and permanent..	3.87
Light and wiring .....	1.57
Ventilating. . . . .	.59
Pipe, air hose and connection .....	.85
Power drills .....	2.94
Hoists and trestles .....	.96
Pumping. . . . .	.21
Sundries. . . . .	.28

Total construction costs .....	\$74.49
Overhead costs, including surveying, management, office, etc. ....	30.91

Total cost per linear foot .....\$105.40

**ONTARIO'S MINERAL PRODUCTION FOR HALF YEAR.**

The statistics of Ontario's metallic production for the half year ending June 30th, 1914, have been compiled by the Bureau of Mines. As in most other industries the production as a whole for the half year shows a decrease. Copper, nickel, cobalt and cobalt

and nickel oxides show an increase, but there is a decrease in gold, silver, iron ore and pig iron. However, there is likelihood of the gold output being increased in the near future. Trade depression does not affect the "market" for this metal.

**Summary of Metallic Production for Half Year Ending 30th June, 1914, Showing Comparison With Production for Similar Period, 1913.**

Product.	Quantity.	Value.	Same period 1913
Gold, oz. ....	99,269	\$2,011,069	\$2,171,147
Silver, oz. ....	13,379,044	7,053,418	7,693,713
Copper, tons ....	8,357	1,197,059	832,645
Nickel, tons ....	13,105	2,872,843	2,514,414
Iron ore, tons ....	47,160	118,119	141,324
Pig iron, tons ....	343,408	4,429,664	5,051,840
Cobalt and Nickel.	129	22,581	7,374
Oxides, lbs. ....	757,268	379,152	186,347

**NOT AS EXPECTED.**

A London Post correspondent has received a letter from a high German officer saying: "The war is not going quite as we expected, and the resistance of the allied forces is extraordinary. We are beginning to feel nervous as to results.

"The German losses are so terrible that the Emperor has forbidden their disclosure. Our generals have been wantonly wasteful of our men, who have been mowed down in thousands. While it is impossible to say what our losses are, I estimate them at between 340,000 and 500,000. If they continue at this rate, we shall be quite unable to meet Russia with any hope of success."

**CANADIAN COAL AND COKE CO.**

At the annual meeting on Sept. 10, the following directors were elected for the ensuing year: Hon. Senator Curry, Montreal; Hon. Senator Mackay, Montreal; J. W. McConnell, Montreal; H. A. Lovett, K.C., Montreal; T. H. Saunders, Cleveland; D. W. Campbell, Montreal; R. M. Ballantyne, Montreal; O. W. Donner, Montreal; W. M. Dobell, Quebec City; John T. Ross, Quebec; A. H. Cook, K.C.; Hon. W. B. Ross, Halifax, N.S.; H. Beverley Robinson, Montreal.

**NIPISSING.**

Shipments of bullion from the Nipissing for the month of August was only \$69,855, owing to the condition of the silver market, but production was as high as ever, viz., \$212,965. The remainder of the Nipissing and customs ore is being stored.

The first discovery of coal in the United States was made by Father Hennepin, a Jesuit missionary, who in 1679 reported the occurrence of "cole" on the banks of the Illinois river, near the present city of Ottawa. The first record of coal mining in Illinois refers to the shipment of a flatboat load of coal mined in 1810 at a point on the Big Muddy river in Jackson county, Illinois.



## KITSAULTE COPPER CAMP, SKEENA, B.C.

The following notes on mining properties situated in Kitsaulte copper camp, Alice arm, Observatory inlet, Skeena mining division, have been taken from a report made to the Provincial Department of Mines, Victoria, B.C., by Mr. D. G. Forbes, who was commissioned by the department to make an investigation of mining properties and conditions in the camp under notice:

"Near the headwaters of the Kitsaulte river and on its west bank, some 16 miles in a direct line from Alice arm, Observatory inlet, a considerable number of mineral claims have, during the last two years, been located at elevations ranging from 700 to 3,500 ft. above sea-level. The trail at present followed to these properties is about 22 miles in length and is impassable for horses after the first five miles. These claims have nearly all been located on a mineralized zone in quartzite interspersed with diabase intrusions. This zone has a probable width of 5,000 ft., and the prospectors state it can be traced on the surface for more than four miles. It forms the backbone of a spur of the mountain range in which the Kitsaulte river has its source, and lies between that river and Evendsen creek. The mineralized belt is bounded on the southwest side by red porphyry and on the north-east side by slates. The ore occurs in a quartz gangue, sometimes in the quartzite and at other times bounded by diabase, but does not appear to have regular walls; although its limits are fairly well defined when it occurs in diabase rock. The mineralization is chalcopyrite and pyrite, the latter being predominant in the quartzite and the former scarce. The mountain is heavily covered with decayed vegetation and standing timber of poor quality, and there are very few exposures of rock in place.

"**Red Point Mineral Claim.**—This claim was one of the first located in the district. The surface has been broken away, leaving a series of bluffs from 50 to 75 ft. high, extending about one-third of the width of the claim. In these bluffs, which are heavily stained with iron, two bodies of ore, consisting of chalcopyrite and pyrite in a quartz-gangue, have been located about 350 ft. apart. Examination of these bluffs can only be made by going down on a rope, after the overhanging vegetation has been removed, and they have not been thoroughly prospected. The attention of the owners has been devoted chiefly to stripping and making trails in connection with the two exposures of ore mentioned, and very little actual work has yet been done to determine the value and extent of the ore-bodies.

The first of these discoveries was made in what is known as No. 1 Bluff, at an elevation of 1,700 ft. above sea-level, and shows from 14 to 16 ft. of siliceous ore near the top of the bluff. It appears to dip to the east into a sag in the bluff, but has not been found at a lower elevation. A sample was taken from this exposure, and assayed: Copper, 5.9 per cent.; silver, 2.5 oz., and gold, \$6 to the ton. No effort has been made to follow this ore.

"At No. 2 Bluff more work has been done than at the first discovery. At an elevation of 1,750 ft. the face of the bluff has been stripped for 38 ft., disclosing irregular bodies of diabase rock alternating with siliceous ore. A tunnel has been driven 15 ft. into the face of the bluff in ore, and now shows at the face 2 ft. of ore, from which a sample was taken which assayed: Copper, 4.6 per cent.; silver, 0.6 oz., and gold, 80 cents to the ton.

"From the above-mentioned point the bluff is nearly vertical for about 60 ft., and shows ore in many places where it has been broken. At an elevation of 2,025 ft. an exposure of ore 20 ft. wide has been laid bare at the top of the bluff, from which a sample was taken as an average across the face, and this assayed: Copper, 8.5 per cent.; silver, 1.3 oz., and gold \$7.60 to the ton. One hundred ft. back from the face of the bluff a cut 6 ft. deep, 5 ft. wide and 20 ft. long has been excavated across the ore, the eastern half of the cut showing the best ore. A sample was taken from the eastern half of this cut, and it assayed: Copper, 4 per cent.; silver, 1.4 oz., and gold, \$9.20 to the ton. A sample taken from the western half assayed: Copper, 0.7 per cent.; silver, 0.2 oz., and gold, \$1.20 to the ton.

"One hundred and seventy-five ft. from the face of the bluff the surface soil and the standing and fallen timber had been cleared off and the quartz exposed again, but had not been broken into. This body of quartz has a strike of N. 45° W. (magnetic), and has been traced farther up the hill toward the Red Point Extension claim. It does not appear to have any distinct walls, and, as far as development has gone, appears to be vertical.

"**Red Point Extension.**—On this claim no work has been done, but a natural exposure in a small bluff shows ore 10 ft. wide, from which a sample was taken, assaying: Copper, 3.1 per cent.; silver, 0.6 oz., and gold, 80 cents to the ton.

"**Combination Mineral Claim.**—On this claim two exposures of ore have been located about 150 ft. apart. No. 1 cut shows 7 ft. 6 in. of quartz containing chalcopyrite and pyrite, with a parting in the centre of 18 in. of vein matter. Sufficient excavation has not been made to expose the limits of this ore; it has an apparent strike of S. 33° W. A sample was taken from the western half, and it assayed: Copper, 3.9 per cent.; silver, 2.2 oz., and gold, 60 cents to the ton. Sample taken from the eastern half of this outcrop assayed: Copper, 1.9 per cent.; silver, 1.2 oz., and gold, 60 cents to the ton.

"Cut No. 2 in the side of the mountain shows 5 ft. of very much oxidized ore, apparently on the foot-wall side; the ore dips slightly to the south, its strike being S. 36° W. The elevation is 2,125 ft. above sea-level. A tunnel has been driven about 30 ft. below this cut, which found ore; at a distance of 34 ft. 6 in. from the portal 15 ft. of mixed ore was passed through, the tunnel being then continued for 17 ft. in country rock. A drift was started on the west side of the tunnel on the best ore, and followed a slip for 33 ft., the face of the drift being in diabase. At a distance of 17 ft. from the tunnel in this drift a small crosscut was driven 10 ft. to the north-west, the face of this crosscut being still in ore. The ore on the dump at this tunnel was sampled, and gave upon assay: Copper, 5 per cent.; silver, 2.8 oz., and gold, 80 cents to the ton.

"The ore in this tunnel is very irregular in value, in places being much mixed with country rock; the drift to the west and the small crosscut are almost entirely in solid ore. The ore cut in the crosscut appears to dip to the south at about 80 deg. Its strike was not determined. More exploration work is necessary to determine the limits and value of this deposit; the ore exposed is, however, sufficient to fully warrant a further expenditure on the property."

### Summary.

After adding brief information of a number of other mineral claims in the vicinity, Mr. Forbes gives a summary, as under:



"Owing to the limited amount of work done, it is not practicable to give any estimate of the probable ore available in these claims; it is, however, reasonable to expect that there may be some deposits of payable siliceous ore within the limits of this mineralized zone, and the little development work already done points to the Red Point mineral claim as a probable location of payable ore. A diamond drill could be profitably employed to test the orebodies on this claim. On the other claims examined so little work has been done (with the exception of the Combination) that no conclusions could be arrived at as to their possible value.

"On the Combination claim there is some siliceous ore, and an expenditure of a few thousand dollars in the present tunnel would decide whether it is advisable or not to go to the expense of a deep-level tunnel. Some more stripping and exploration work on the surface could also be done to advantage.

"It is essential that the Government pack-trail should be pushed up to the flat on the Kitsaulte above Evendsen creek as soon as possible, as no satisfactory work can be done at present, owing to the cost of getting in supplies (30 cents a pound) and the time wasted in packing, practically 15 miles, on men's backs."

#### BUTTE AN OPEN CAMP NOW.

Hereafter Butte will be an open mining camp, and miners may belong to any union or none. This was decided on at a meeting of mine operators on Tuesday evening, and a statement of the new policy was issued and signed by all the companies, except the Davis Daly, which was not represented at the meeting. The signatories declare that the existing scale of wages and rules as to hours will continue in effect. Contracts with all other organizations will also be carried out.

The companies say that the attitude of the new Miners' Union toward employers, as expressed in notices and their constitution, put that organization beyond the possibility of being recognized or dealt with and its jurisdiction will not be recognized.

It is claimed by the companies that fully 80 per cent. of the working men approve of the action of the companies.

After two days' holiday the mines have resumed operations. Silver Bow mine of Anaconda, with 150 men, started up Tuesday. It is understood Anaconda has 500 armed men and several modern machine guns around the Hill properties. The mines are equipped with searchlights, and the miners have to pass a line of sentries in going to work.

Some ten thousand miners, until recently all members of Butte's Miners' Union No. 1, of the Western Federation of Miners, but now divided between that organization and the newly formed Butte Mine Workers' Union, were notified that from the viewpoint of their employers it made no difference whether they belonged to either organization or none. This decision, signed by the 12 companies which represent the copper output of Butte, was reached late last night, and the town, tight in the leash of martial law, bristled with excitement today when confronted with it.

"So far as the local union of the Western Federation of Miners is concerned," the statement said, "it became apparent immediately after the dissension of June 13th that the vast body of men employed in the Butte mines were openly in revolt against that organization, and that they would in no circumstances longer be identified with it. Since then that organization has demonstrated its inability to assume control over the underground workers of Butte."

#### CALUMET AND HECLA.

The Calumet and Hecla Mining Co. has passed quarterly dividend due at this time. Three months ago \$5 was declared, a year ago \$6.

In a circular to stockholders the directors say:

"In view of the unsettled condition of the copper market in this country, and the interruption of the company's business with its foreign customers, the directors have decided not to declare a dividend at the present time.

"The product of the mine will be curtailed and the wages and salaries of all employees and officers will be reduced. It is planned to continue operations on three-quarters time rather than to discharge any large number of men, and by keeping the entire force at work part of the time it is hoped that the organization of the company may be kept intact and a lesser hardship imposed on them."

But once before since 1871, when dividend payments were started, has Calumet and Hecla, the premier dividend payer among the North American copper properties, been obliged to pass its dividend. This was in April, 1884, when the directors decided to omit the dividend payable the following month. For a period of 30 years, therefore, the company has had an unbroken record. It is to be noted, however, that in 1889, 1894 and 1901 the company paid but three dividends in the twelve months.

#### GERMAN PATENTS.

Ottawa, Sept. 8.

Definite announcement by the Government on the question of German and Austrian patents held in Canada may be expected within the next few days.

Action has been delayed pending receipt of the rules adopted by the British Government in regard to patents held in the United Kingdom. These have now been received from the Hon. G. H. Perley, acting high commissioner, and are before the Government.

They provide for the suspension of patents held by subjects of enemy states during the continuance of the war and for six months after its conclusion. It is probable that action by the Dominion Government will be along similar lines.

The Government have been notified that Norway has extended by nine months the period during which patents may be received. The prolongation applies till June 30, 1915.

#### STEEL PLANT ERECTION.

The erection of the Fort William plant of the Steel Company of Canada, on which construction was started last year and not completed owing to the dull season of manufacturing, has been resumed and a large gang of men are hard at work on the completion of the building. J. O. Callahan, general manager of the Steel Company, and B. H. Pratt, of the contracting firm, are at present in the city, superintending the work of construction, and have stated the plant will be ready for operation between November 15th and December 1st of the present year.

#### COPPER.

New York.

The copper market continues quiet, and no large orders are in sight. A few sales are being made for domestic delivery on basis of 12½ cents a lb. Export demand is light. England and France are taking copper, but in small amounts. One producer figures that the brass companies are operating from 65 per cent. to 70 per cent. of capacity.



# RECRYSTALLIZATION OF LIMESTONES AT IGNEOUS CONTACTS\*

By C. K. Leith, Madison, Wis.

At the outset I would like to make it clear that I do not enter this discussion in a controversial spirit, but in an attempt to contribute something helpful to an understanding of a difficult problem. I have too high regard for the sterling quality of the work of the men who have studied this subject in detail to offer anything in the way of essential contradiction to their statements of fact. Difference of opinion arises from differing valuation of the possible alternative hypotheses which these facts suggest.

Some degree of recrystallization in limestone contact zones has been recognized by many investigators. Earlier investigators, for the most part, assigned an important, if not the most important, role to recrystallization in development of these zones. With the growing recognition of introduction of ores and gangue materials into the contact zone from igneous rocks through the medium of primary magmatic solutions, there has been a tendency to ascribe to this process most, if not all, of the chemical and mineralogical characteristics of the contact zone. This has involved a correspondingly diminished emphasis on recrystallization of substances already there as a factor in the process, and in some cases even the complete elimination of this hypothesis. From detailed study of a few contacts, casual observation of others, and a general familiarity with the literature, some of us have been led in recent years to raise the question whether the pendulum has not swung too far away from recrystallization toward direct introduction from igneous sources, and to argue for more recognition of the part played by recrystallization. The inevitable sequence has been that those of us who have taken this view have been charged, at least by inference, with emphasizing recrystallization to the total exclusion of the alternative process. Scientists, like other men, like to classify and pigeon-hole views under simple and definite designations, leaving out qualifications which would tend to make the classification more difficult to state. This has made the problem seem more definite and simple, but has tended to obscure the fact that the disagreement is primarily not one relating to essential facts, but one of emphasis. The relative importance of processes seems to vary greatly in different districts. Until many other contacts have been carefully studied, agreement as to the relative importance of processes in general is perhaps not to be expected.

Evidences for recrystallization, briefly summarized and without qualification, are as follows:

1. So far as there is recrystallization it relates mainly to part of the silicate minerals and the residual carbonates of the contact zone. By no stretch can it explain the metallic minerals. The development of silicates from the lime or magnesia carbonates involves the elimination of all the carbon dioxide and some of the lime and magnesia, with recrystallization into silicates of part of the lime and magnesia together with other impurities which may be present, such as silica, iron, kaolin, and other substances. In certain districts the composition of part of the silicate zone (usually the outer part) corresponds approximately to the composition of the original carbonate rock, minus carbon dioxide and a part of the lime and magnesia. No analyzed

samples have shown exact correspondence. It would be difficult to find exact correspondence because of later replacements, because of original variation of beds, and because of difficulty of confining sampling only to the recrystallized zone; but in some cases there is a remarkable tendency toward the constancy of silica-alumina ratios in comparison of original limestones and the supposedly recrystallized phases. The ratio is not absolutely maintained, but the variation in the silica-alumination is slight as compared to the variations which are found in the parts of the contact zone in which materials have been clearly introduced. It would be remarkable if substances brought in at random from magmatic sources should approximate so closely the composition of residual impurities of limestone. A most striking case of this, which has been worked out quantitatively on a large scale, is the contact metamorphism of cherty iron carbonates by great masses of gabbro in the Lake Superior country. Here the iron-silica ratio of the altered phase corresponds almost exactly with that of the original carbonate rock, the change being merely an elimination of carbon dioxide. Analyses have been taken from many thousands of samples brought up in drill cores and in continuous sections across the formation.

2. Secondary silicates of contact zones have often been found to be localized along cherty beds or around fragments of chert in the carbonate. Again the Lake Superior region furnishes an illustration in that cores brought from a depth of many hundred feet, where there has been no chance of surface alteration, and at some distance from the intrusive, show the development of secondary iron silicates, principally grunerite, along contact of carbonate and siliceous layers, in a rock which is so dense there is little or no possibility for the introduction of these substances from without. The ratio of silica to iron has been almost exactly maintained. And yet these are clearly developed under influence of intrusives.

3. The similarity of secondary silicates in limestones and marbles far removed from igneous contacts to some of those developed at contacts is also suggestive evidence of recrystallization along contacts.

4. Elimination of carbon dioxide and lime is postulated under either hypothesis, "replacement" or "recrystallization." The natural consequence of elimination is recrystallization of the residual materials, whether or not these are supplemented by accessions from magmatic sources. There is no good *a priori* reason why accessions should always exactly balance elimination, especially when the physical conditions of intrusion are considered—and there is no satisfactory quantitative proof that they have. Under physical conditions which have been supposed to attend the earlier stages of intrusion of a magma it is easy to conceive of pore spaces caused by elimination to be closed as fast as formed, thereby reducing volume, and, in fact, it is usual to conceive of the pressure actually being a factor in the elimination. Under the replacement hypothesis we find it necessary to assume that whatever the pressure conditions were, whether those tending to close up openings or not, the materials taken out and those introduced were delicately balanced in

\*A paper presented at the New York meeting, A.I.M.E., February, 1914.



volume; that just enough is introduced in any one place to take the place of that which is left.

5. The reduction in volume required by the recrystallization hypothesis cannot in most cases be disproved. So far as original textures are retained, as they are in some districts, then it is possible to infer, rightly I think, that the volume has not been considerably reduced, and therefore, that elimination has not taken place except by equivalent introduction of new materials. But the supposedly recrystallized substances are usually in a structurally amorphous zone which may well be the residual of an original mass many times greater. Opponents of the recrystallization hypothesis have argued that the necessary elimination of substances, and consequent reduction of volume, is too large to be reasonable. The reasonableness or unreasonableness of this is a difficult point to argue. It is largely a matter of personal opinion. To me it does not seem inherently improbable. Elimination is equally necessary to the alternative hypothesis of introduction of the materials from magmatic sources. Without elimination it is necessary to assume an enormous increase in volume to take care of enough new material to give an average composition of the contact phase.

6. Discrimination of two phases of contact metamorphism is essential to an interpretation of conditions of formation of contact zones.

Students of contact metamorphism may to much advantage study the mathematical theory of heat conduction as applied to an igneous contact. We are indebted to Professors Ingersoll and Zobel for an illuminating discussion of the principles of heat flow from an igneous rock of given dimensions into surrounding limestone. Their conclusions, which seem to be well based on general physical principles, are especially interesting in showing the remarkably slow progress of a heat wave into the limestone. Quoting from Ingersoll's and Zobel's discussion of a hypothetical case:

"The conclusions to be drawn from the curves are: first, that the cooling is a very slow process, occupying tens of thousands of years; second, that the boundary-surface temperature quickly falls to half the initial value and then cools only slowly, and also that for a hundred or more years there is a large temperature gradient over only a few meters and a very slow progress of the heat wave; third, the maximum temperature in the limestone, or the crest (so to speak) of the heat wave, travels outward only a few centimeters a year. The mass behind it will then suffer a contraction as soon as it begins to cool, and the cracking and introduction of mineral-bearing material is doubtless a consequence of this."

Especially significant is the inference from the curves of heat flow that in advance of the heat wave the rock is tending to expand, therefore, to be compressed, whereas, following it during a long period of time there is contraction and the development of cracks. These conditions seem to favor two principal phases of contact metamorphism.

As the igneous mass advances into limestone it presumably is exerting mechanical pressure, judging by deformation at some contacts, and at the same time sending out heat into the surrounding rock, which, itself, increases the pressure. It is difficult to avoid the conclusion that for a time at least the adjacent rocks are under considerable pressure and that this pressure would favor elimination. It does not seem at all necessary or probable that under pressure this elimination should be immediately followed by introduction of

other substances from the magma, or, putting it in another way, that substances from the magma should always so closely follow elimination as to replace molecule by molecule the original materials and thereby prevent any reduction of volume. As the crest of the heat wave advances into the surrounding limestone, lower temperatures follow, with the result that there is contraction and the development of openings. This contraction may effect not only the limestone but the intrusive itself. Into such openings the magmatic solutions may freely enter, and there are deposited the ores and some of their gangue materials. At the same time these solutions may replace the materials of the surrounding rock to a greater or less extent.

That contact metamorphism of limestone has been accomplished in two successive phases has been pretty well proved at certain contacts. It seems probable that when attention is directed specifically to this feature it may be found at others. The first phase seems to be characterized by the production of an amorphous, homogeneous, silicate mass, not definitely associated with fissures. In some cases this is discriminated sharply from, in other cases it merges gradually into, a phase characterized by sulphides and other ore-bearing minerals with their gangue materials, which occur much more largely in fissures. These fissures may often be seen to traverse the silicate zone of the first phase. The minerals of the later phase, both because of their composition and because of evidence of their transportation, cannot be regarded as recrystallizations of materials in place. They afford evidences of introduction from magmatic sources.

The two phases of alteration may merge one into the other both in time and place. The later phase may be expected to obliterate to some extent the earlier phase. Ordinarily the later minerals differ from the earlier ones, but certain silicates, quartz, and other minerals, may be common to both.

I do not attempt to cite evidences in detail from specific localities. My purpose is rather to outline the case for recrystallization. W. L. Uglow, in a recent paper, has cited evidences and references in some detail and in a forthcoming paper will cite more. I do not contend that all contacts will be proved to show important recrystallization or even that all of the illustrations cited in Mr. Uglow's paper are valid ones. I hold only that recrystallization has been proved in enough places and to sufficient degree to warrant its citation as a usual accompaniment of the process of introduction of magmatic materials. In some cases it seems to be important. In others evidence of it is slight or absent, though in these cases it may be masked by the introduction of materials in the second phase of contact metamorphism. Its complete absence in the nature of the case is difficult to prove quantitatively. Advocates of the recrystallization hypothesis have not, so far as I know, held that it was sufficient to explain all contact phenomena. They have offered it only as an explanation of one phase of contact alteration. Failure to consider this hypothesis involves failure to consider the possibilities of a two-phase alteration which seems to me to be the probable key to much contact metamorphism. With the majority of economic geologists, I recognize the conspicuous evidence of the introduction of magmatic materials. My plea is that this hypothesis be not magnified to the exclusion of the recrystallization hypothesis. Quantitative studies of contacts based on adequate sampling have unfortunately been rare. Without them, conclusions can be only qualitative and not exclusive.



# THE SAFETY OF UNDERGROUND ELECTRICAL INSTALLATIONS\*

By C. M. Means

Considering the hazard involved in mining operations, statistics show that a very small percentage of accidents is chargeable to electricity. These accidents do represent quite a large percentage of those that are preventable and they are the direct result of the introduction, for purely economical reasons, of a dangerous element. The introduction of electricity in mines should decrease the hazard, and in no case should electricity be applied to the mechanical operation of equipment if by so doing the dangers incidental to mining are increased.

The greater number of accidents are the result of persons coming in contact with exposed conductors at potentials varying from 250 to 500 volts direct current. The use of alternating current at higher potentials than these is quite common in large mines, but it is very rare that an accident happens from this source. This is explained by the fact that where these high voltages are warranted, proper precautions are taken, and the installations are directed by those who fully appreciate the dangers incidental to the work. Direct current is in much more general use than alternating current because of its adaptability to haulage locomotives and the low cost of installation in small operations. We are, however, coming to a more extended application of alternating current for the operation of mechanical devices used in connection with mining.

Our underground direct-current wiring system is an evolution from the surface trolley and feeder systems. This is probably due to the fact that our earlier successful applications were electric locomotives, which required the use of a trolley wire. The trolley current has been almost banished from industrial establishments on the surface because of the hazard involved, yet we use it indiscriminately underground, where the dangers from accidental contact or fire are infinitely greater. This does not mean that the underground trolley systems should be eliminated, but it does imply the proper safeguarding of such equipment as is necessarily a part of the trolley systems.

It is a fact that the men now employed in the installation and maintenance of mining equipment may be in many cases incompetent or not thoroughly familiar with the work, but they are the men who must do the work and, in order to do it properly, it is necessary that they be educated and guided in their task. Men who have been trained in industrial plants on the surface do not care to take up mining work, and the men to do underground electrical work must be recruited from men actually working in the mines. These men have no training except that gained from association with men engaged in the work. The result is, they do their work in such a manner as seems to them the most expedient with the results to be attained, and not in keeping with any clearly defined method or studied system.

For all electrical work on the surface we have the rules of the Underwriters' Association. Electricians and wiremen familiarize themselves with all requirements of the Underwriters, and the result is that their work is done in a thorough and safe manner. A complete set of electrical rules similar to those of the Underwriters' Association, but made applicable to underground work, would go a long way toward solv-

ing the problem, if they were made suitable for, and received, general application.

These rules would naturally be evolved from all data available and an investigation of all electrical accidents over a period of time; and a complete analysis should be made of causes, as well as methods to prevent a recurrence in the future. We have available the rules contained in the bituminous mine law of Pennsylvania and other States, rules of the Underwriters' Association, and rules of certain mining corporations and municipalities, that could be used for a basis. Any set of rules, no matter how carefully compiled, will naturally meet with a considerable amount of opposition and criticism, and a large part of the criticism will be warranted. This very feature will result in devising a set of rules that will meet the situation in its entirety, and make it possible to almost eliminate this class of accidents.

The problem of working out such a set of rules is a very formidable one, but no more difficult of solution than that which the Underwriters' Association has already solved or is successfully solving. It is fully apparent that additions or changes must be made from time to time to keep pace with an industry that is continually being developed and expanded.

The electrical rules contained in the bituminous mine law of Pennsylvania have been in effect something over two years, but last year represented the first opportunity we have had to judge the operation and effect on fatalities resulting from the use of electricity. While the exact records are not available, it is safe to say there will be a material decrease in the number of fatalities resulting from the use of electricity in this district, and this in face of the fact of a very material increase in the use of electrically driven devices used in the production and transportation of coal.

These rules represent a first step in the standardization of electrical equipment and wiring as applied to underground workings, and the results stated are conclusive proof of what can be done along this line. These rules have resulted in the education of the men who do the work, and they now know, in a general way, what they are required to do. Prior to the enactment of this law, the use of electricity in mines was tolerated but not authorized, and not subjected to any rules or regulations. It is only natural to suppose that this resulted in installations of all kinds. Some installations represented an unnecessary expense in doing everything possible to meet every restriction that might later be placed on the work, but a large number of the plants were put in simply to do the work, with very little regard to the safety of the employees. This is all changed now, and each operator knows what is required, and, wherever possible, meets all of the provisions contained in these rules.

These rules met with more or less opposition when first incorporated in the mining law, but they now meet with the favor of all progressive mining companies and have been of material value to all concerned.

Instead of restricting the use of electricity, these rules have caused a very material increase in this method of transmitting power to operate the different

\*A paper presented at the New York meeting, A.I.M.E., February, 1914.



mechanical devices used in the production of coal, and are of material value to the coal industry in this region, as well as to electrical and kindred industries.

When the Underwriters' Association introduced rules governing electrical work, inspectors were employed to see that the work was done in keeping with the standard suggested by their code. Formerly these inspections covered all work done where insurance was carried, but as the workmen became more skilled the inspections were less comprehensive, and under certain conditions were omitted entirely.

For a period of time it will be necessary to employ a certain number of electrical inspectors for underground work to see that the rules are complied with. An inspector would be of little value unless he had a definite set of rules on which to base his recommendations. His duty will be to act largely in an advisory capacity and to interpret the rules laid down. The mining departments of the different States employ a certain number of mine inspectors, who can take care of the electrical work after they get entirely familiar with the rules and application, except where new schemes or unusual installations are involved. It may require some little time for these inspectors to become sufficiently familiar with electrical equipment and its operation, but a knowledge of this phase of the situation will be just as essential and as readily acquired as that of ventilation.

In the bituminous fields of Pennsylvania the mine inspectors paid very little attention to the electrical equipment so long as the use of electricity was simply tolerated, but just as soon as its use was authorized, and rules formulated covering the work, they familiarized themselves with the rules and their application, and in the average installation they are able to judge intelligently as to the safety of the equipment.

It is not within the province of this paper to suggest who should work out a proper set of rules or how they should be applied. The increased safety that would be secured would fully warrant the co-operation of the government. Electrical manufacturing companies should be very much interested because of the commercial advantages gained by reducing the hazard, thereby popularizing the use of electrically operated devices. The mining companies should also be interested because of the reduced hazard to employees and property that would naturally follow. A more extended application of electricity would be warranted with reduction in costs of operation. All safety organizations, as well as engineering societies, would be interested.

Taken in its entirety, considering the increased safety that would naturally follow, the commercial advantages to be gained, and the large number of interests involved, the expenditure of the necessary time, labor and money is fully warranted in the formation of a proper set of rules covering this work.

### MANGANESE.

For commercial purposes materials containing manganese are separated into four classes—(1) manganese ores, (2) manganiferous iron ores, (3) manganiferous silver ores, and (4) manganiferous zinc residuum. Though manganese forms a part of about a hundred minerals and is a relatively widespread element, practically all the manganese of commerce is derived from material containing one or more of the minerals polianite, pyrolusite, psilomelane, wad, manganite, braunite and franklinite.

Manganese ore is mined in Canada at New Ross, Nova Scotia.

## TESTING OIL SHALES

According to E. G. Woodruff and David T. Day in a bulletin published by the U. S. Geological Survey, it has been known for many years that highly bituminous shale, or oil shale, occurs in the Green River formation of the Uinta Basin in Colorado and Utah. Eldridge, who studied the gilsonite veins in this region in 1901, incidentally mentions the shale. He states that the Green River formation includes "shales and limestones, bituminous, locally in a degree to be of economic value." Since the publication of that paper reports have been current from time to time that this shale is rich in petroleum, and that it compares favorably with the Scotch oil shale which has been successfully utilized in the commercial manufacture of petroleum products for half a century.

In order to determine the geographic distribution and thickness of the shale E. G. Woodruff, assisted by W. P. Woodring, carried on in the summer of 1913 a reconnaissance survey of a part of the area occupied by the Green River formation in Utah and Colorado and in collaboration with D. T. Day made field tests to determine the amount of oil and other distillation products that can be obtained from the shale. Later Mr. Day made laboratory tests of some of the same shale and also examined the oil obtained in the field in order to determine its quality and to see if by better methods of distillation its quality could be improved.

Field tests were made in a portable still designed by Mr. Day and operations were at first carried on under his immediate supervision. The basic principle of the operation was to heat the shale, thus vaporizing the volatile hydrocarbons and destructively distilling the other forms of organic matter present in the shale. The distillation products were conducted through a pipe to a condensing coil, where the heavier products were liquefied and conducted into receivers and the gases permitted to escape.

The retort into which the shale was charged consisted of a section of 12-inch iron casing pipe 4 ft. long, having flanges screwed on the ends and a removable iron plate with asbestos gaskets fitted to each end of the retort. On one side of the retort there was fitted a small steam dome a pressure gauge, and a safety valve. From the top of the dome a pipe led to a block-tin condensing coil in a small water-filled tank. The coil discharged into Wolff bottles set in series and provided with stopcocks so that the liquids could be drawn off without interfering with the operation of the condenser. During the operation the retort was suspended from iron supports in a narrow trench, covered with iron plates and earth, and a flue erected at the back. Heat was obtained from a wood fire placed under the retort.

The operation consisted of removing the head, charging the retort with shale broken into pieces not larger than 4 in. in diameter, and replacing the head. Fire was started to give a gentle heat at first and was gradually increased until the lower part of the retort became red hot; then the fire was held constant until near the close of the process, when it was increased for a short time and then allowed to subside. Water vapor, gas, oil and gas, and finally only gas was the order in which the products were obtained. From seven to eight hours' heating was required for a charge. The liquid products were sealed in cans and shipped to the Washington laboratory.

The amount of oil obtained in the various tests ranged from 10.4 gl. to 61.2 gl. to the ton.



As a check on the field work and also for the purpose of making tests which required special apparatus, samples of shale were distilled under the supervision of Mr. Day. The laboratory tests included distilling the shale in a regular distilling flask, using 100 grams for a charge. The flasks were heated electrically in the usual way and it was found possible to continue the heating until the glass melted. It was found also that when this stage had been reached practically all the volatile matter had been distilled from the shale, leaving a crumbling dry coke. The gases given off were collected and also the ammonia water. The percentage of ammonia was determined in the general chemical laboratory.

The shale oils obtained in Scotland and elsewhere and those obtained in the present series of distillations are characterized by a large proportion of unsaturated hydrocarbons, involving a considerable loss when these oils are refined. In refining them it is not necessary to remove all these unsaturated hydrocarbons but only those which prevent the manufacture of comparatively colorless and odorless oils by the usual refining process. The proportion of these compounds differs greatly in shales from different parts of the world.

## BOOK REVIEWS

**IRON ORES OF LAKE SUPERIOR**—By Crowell & Murray — The Penton Publishing Company, Cleveland, Ohio—For sale by Book Department, Canadian Mining Journal.

This is the second edition of a very useful work on the Iron Ores of the Lake Superior region. It is largely a compilation of material which has appeared in the various trade journals, geological reports, and technical societies' transactions. The material has been rewritten and corrections made.

The several chapters deal with the early history of the region, geology, mineralogy, production of ore, dock equipment, classification of ores, beneficiation of ores, methods of analysis, fuel, engineering, location and description of mines.

Several maps accompany the text. Interesting features of the volume are the description of methods used in exploring, mining and transporting the ore.

A useful part of the book is the statement of production and character of ore from each mine in the Lake Superior district.

**RECENT COPPER SMELTING**—Edited by Thos. T. Read—Published by the Mining & Scientific Press, San Francisco, and the Mining Magazine, London—Price \$2.50—For sale by Book Department, Canadian Mining Journal.

This is a compilation of recent articles on copper metallurgy, and is intended to present in convenient form the views of well known engineers on current practice in all parts of the world.

Most of the articles have appeared in the pages of the Mining & Scientific Press during the past four years. Some are from the publications of the American Institute of Mining Engineers.

As the metallurgy of copper has made great strides in the last decade, it is very difficult for the copper metallurgists to keep in touch with practice as it is developed. Greater advance has been made in the metallurgy of copper than in any other metal during recent years. These advances are indicated in publications of the technical journals and mining insti-

tutes. A real service has therefore been done by Mr. Read in putting together papers on the subject which are otherwise not readily available.

**CRYSTALLOGRAPHY**—By T. L. Walker, M.A., Ph.D. Professor of Mineralogy and Petrography, University of Toronto—Price \$2.00—McGraw Hill Book Co.—For sale by Book Department, Canadian Mining Journal.

This book has been written to present a connected elementary statement of Crystallography along the lines developed by Dr. Victor Goldschmidt, of Heidelberg.

**HANDBOOK OF MILLING DETAILS**—Compiled from the Engineering & Mining Journal, by the Editorial Staff—Price \$4.00—McGraw Hill Book Co.—For sale by Book Department, Canadian Mining Journal.

This book is a collection of articles that have appeared in the Engineering & Mining Journal during the last two or three years under the general head of "Details of Metallurgical Practice." The character of the book is in all respects the same as "Handbook of Mining Details."

The compilation covers the publications from November, 1909, to December, 1913, inclusive.

It is a handbook that is a more or less random collection of useful information, rather than a treatise.

While the major part of the book is devoted to milling, there is also some information included concerning smelting and refining practice.

**USEFUL MINERALS AND RARE ORES**—By Alex. McLeod,—Jno. Wiley & Sons, Renouf Publishing Co., 25 McGill College Ave., Montreal. Canadian agents—Price \$1.25—For sale by Book Department, Canadian Mining Journal.

This book has been written to furnish simple means for the determining of useful minerals. Practical instructions that will aid in the search for and the determining of the useful minerals and rare ores, are given. The author claims that absolutely no skill is required to carry out any of the tests, and the apparatus required is very inexpensive.

Among the subjects dealt with, are: Prospectors' pan, the streak of minerals, hardness, prospecting hints, preliminary tests, surface changes, surface indications, apparatus and chemicals required for testing, hints on testing, methods of testing for the several metals, tables for determination of minerals, distinguishing tests for minerals which resemble one another.

This little book is not intended for mineralogists, but should be useful to those without experience who wish a guide in the search for minerals.

**THE MINING WORLD INDEX OF CURRENT LITERATURE**—Vol. V. First Half Year, 1914—By Geo. E. Sisley, Associate Editor Mining and Engineering World, Chicago.—For sale by Book Department, Canadian Mining Journal.

This volume covers the world's literature on mining, metallurgy and kindred subjects, and embraces all reference of any importance to the literature of the field it exclusively represents. It is of great assistance in the search for information. The plan is simple and the list of articles complete.



# THE APPLICATION OF KICK'S LAW TO THE MEASUREMENT OF ENERGY CONSUMED IN CRUSHING

By S. J. Speak.

Mr. H. Stadler, in his paper "Grading Analyses and Their Application," states Kick's Law as follows:

"The energy required for producing analogous changes of configuration of geometrically similar bodies of equal technological state varies as the volumes or weights of these bodies."

In other words this law says that to break 1 cu. in. of material into two pieces will require ten times more energy than is required to break a piece of exactly similar material of 1/10 cu. in. size into two pieces. With one limitation to be mentioned below this is a statement of a mathematical fact, and, therefore, indisputable.

The law assumes that the tenacity of a material is a constant quantity, which is not absolutely correct. The assumption is sufficiently true for sizes appreciable by the naked eye, but for finer sizes it has been known for many years past not to hold good. The following figures taken from a paper by Gibson & Gregory on "Notes on the Tenacity of Spun Glass," will serve as an example to show the enormous increase in tenacity as such threads become fine.

Diam. in mm.	Tenacity in dynes per sq. cm.
0.009 .....	60 $\times 10^7$
0.0082 .....	83 $\times 10^7$
0.005 .....	97 $\times 10^7$
0.0042 .....	126 $\times 10^7$
0.000315 .....	405 $\times 10^7$
0.000186 .....	424 $\times 10^7$

A similar increase in tenacity has been found in testing fine metallic wires, though to a smaller extent.

Quincke suggested that the great increase observed in the case of metals was due to a surface tension analogous to that observed in liquids, but, whatever the true explanation, it is a well-established fact that fine particles have a greater tenacity than large particles. This being so, Kick's Law becomes more and more inaccurate as the sizes become smaller, even with a material which is otherwise perfectly isotropic; but the discrepancies are probably not very marked until sizes as small as 200-mesh are reached. We may, therefore, apply Kick's Law to the ordinary problems of ore crushing, in so far as this particular point is concerned.

However, though in itself approximately correct, Kick's Law may not be strictly applicable to the problems of ore crushing, because the stipulated conditions of "equal technological state" do not exist in the various stages of crushing an ore. Consider, for instance, a piece of ordinary oxidized auriferous quartz, 4 in. in diam.; it may contain scores of small vugs partly filled with oxide of iron in powdery form, and also small cracks filled with clay. When such a piece is submitted to crushing, the first fractures will take place mostly at cleavages and other weak places. The tenacity of a piece of such ore 4 in. in diam. will, therefore, be relatively less than that of pieces say 1/10th in. diam., because the latter will possess the same original lines of weakness which would already have been taken advantage of at the initial crushing. Further, by the time such a piece of ore was crushed to, say, 10-mesh

in water, the greater part of the clay, etc., in the ore would be washed away as slime, and would thus have been converted into slime without any real consumption of energy.

The author has noticed on plotting various screen analyses that the product of a machine re-grinding sands or middlings contains relatively less slime than if the same machine were treating original ore. The only apparent reason for this is that the original ore contained some natural slime, whereas the sand or middling product had previously been nearly freed from such material.

As a further illustration of the difficulties of obtaining "equal technological state," we may refer to the problems of ore dressing. It is often found that after a particular ore has been crushed through a certain aperture, the bulk of the mineral is freed from the gangue. Suppose the mineral be galena, the gangue be quartz, and the mesh 60; in such a case many of the particles larger than 60-mesh would consist of quartz and galena, whereas most of the smaller particles would consist either of quartz or galena, so that if, as seems probable, the attachment of the galena to the quartz is a plane of weakness, the exact condition of equal technological state is not maintained. Mr. Stadler maintains that Kick's Law would apply, but the argument he advances in support of his contention overlooks the point that the plane of attachment of one mineral to another is in all probability a plane of weakness.

In general, regarding the application of Kick's Law to ore crushing, it seems reasonable to conclude:

- (1) That it will tend to over-estimate the energy consumed in coarse crushing.
- (2) That it will tend to under-estimate the energy consumed in the grinding of non-slimy sand into slime.
- (3) That it will tend to over-estimate the work done in making slime from such ores as contain slime as an original constituent.

These conclusions seem to be borne out by what is noticeable in actual practice. Consider, for example, the following instance.

Mr. Stadler mentions that the relative efficiency of stamps decreases rapidly from 78.3% for 9-mesh screen to 39.2% for 1.200-mesh, and to 33.1% for 1.600-mesh. The more one thinks about the action of stamps, the less can one believe that this apparent falling off in efficiency is solely due to the unsuitability of stamps for fine crushing.

However, although Kick's Law may not be strictly applicable to all the problems of ore crushing, there has not yet appeared a more rational basis on which to work. Rittinger's Law, as commonly formulated, viz., that "the work of crushing is proportional to the reduction in diameter" is open to the same objections as above stated against Kick's Law, besides other much more serious objections.

Stadler's adaptation of Kick's Law to ore crushing is, perhaps, marred by the employment of the term "energy unit," but otherwise is a fairly serviceable method, and will, no doubt, become increasingly used.

\*A paper presented at a meeting of the Institution of Mining and Metallurgy, May 21, 1914.



## PERSONAL AND GENERAL

Mr. E. R. Davidson, of Spokane, Washington, manager for the Eagle Mountain Mining Co., of that city, was recently at the company's Eureka group property in Ainsworth mining division, B.C.

Mr. John A. Finch, of Spokane, one of the largest shareholders in the Standard Silver-Lead Mining Co., operating near Silverton, Slocan lake, B.C., has been visiting Mr. Geo. H. Aylard, the company's general manager, at his home in Victoria, B.C.

Mr. W. S. Hawley, manager for the Silver Hoard Mining Co., of Spokane, last month spent several days at the company's mine in Ainsworth camp, B.C.

Mr. O. E. LeRoy, of the Geological Survey of Canada, was lately on an official visit to British Columbia. From Victoria he returned to Alberta via Vancouver and Nelson.

Mr. John McMartin, of Cornwall, Ontario, has been in British Columbia for a short time, looking into conditions at the Motherlode gold mine at Sheep creek, Nelson mining division, in which he is largely interested.

Mr. W. Manning has been examining the Yankee Girl mine for the Texas people who are operating it. This mine is situated near Ymir, B.C.

Mr. Wm. Thomlinson has lately been in Boundary and Similkameen districts, British Columbia, arranging for obtaining representative collections of ores for the Panama-Pacific Exposition in 1915.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., of Toronto, has notified employees of the company that the positions of all who enlist for service in the war against Germany and Austria will be open for them on their return to the Crow's Nest district.

A number of mining engineers from Kootenay district, British Columbia, have volunteered for service in the European war and have left for the East en route to England. They include Messrs. Thomas Brown, Jr., A. W. Davis, A. J. L. Evans, R. G. McFarlane, C. B. North, B. T. O'Grady, G. E. Revell, L. B. Reynolds, and G. B. Webster.

Mr. J. B. Tyrrell has recently been working in southern British Columbia on the question of the occurrence of oil in paying quantities.

In consequence of the war, the Comité des Forges de France has been obliged to cancel all arrangements for an autumn meeting of the Iron and Steel Institute in France this year. Under the circumstances, the Council has decided that it would be advisable to postpone for the present the organization of any alternative arrangements for an autumn meeting for the reading and discussion of papers.

Mr. John A. Dawson and Miss Hazel Bigger were married in Ottawa on Thursday, Sept. 3, 1914.

Mr. J. W. Astley has returned to Toronto from the Pacific Coast, where he has been for some time examining mining properties.

M. Beatty & Sons, Ltd., of Welland, recently launched another dipper dredge at their shipyards on the Welland Canal. The steel hull is 107 ft. long, with 36 ft. beam. It is 9 ft. 3 in. deep at the bow and 8 ft. 3 in. at the stern. The boiler is of the Scotch marine type, and is of ample size to furnish steam for the entire plant when working under heavy load. The builders expect to finish work on this dredge early in the fall.

Mr. G. Watkins Evans, consulting coal mining engineer, of Seattle, who during 1912 examined the Ground Hog coal field of British Columbia, and who examined the Matanuska coal field in Alaska for the U. S. Navy

during the summer of 1913, is now in Montana examining coal properties.

Mr. Walter E. Segsworth, of Toronto, and Miss Ruby Le Roy, of Markham, were married on Wednesday, September 8.

Francis Glover, mining engineer for the Princeton Coal and Land Co., recently made an examination of the mines of the Columbia Coal and Coke Co., at Coalmont, B.C.

Mr. A. P. Houle has been appointed Professor of Metallurgy at the Michigan College of Mines.

At a meeting of the Board of Directors of the Westinghouse Electric & Manufacturing Co., held in New York City, Wednesday, August 26th, Mr. Henry D. Shute was elected treasurer to succeed Mr. T. W. Semon. Mr. Truman P. Gaylord, district manager of the Electric Co. at Chicago, was elected acting vice-president to succeed Mr. Shute.

Messrs. Fraser & Chalmers, of Canada, Ltd., have just received an order from the Siemens Co. of Canada for a 188 h.p. Terry steam turbine, running at 3,600 R.P.M., fitted with Falk gearing reducing speed to 1,200 R.P.M., suitable for direct coupling to a Siemens exciter generator.

The Canadian General Electric Co. has issued a bulletin on Centrifugal Compressors, by Louis C. Lowenstein.

## OBITUARY

Edward Leigh Goodwin, son of Dr. Goodwin, Director of the School of Mining, Kingston, died at Sudbury on August 27th. Mr. Goodwin graduated a few years ago from the School of Mining, and was in the employ of the Mond Nickel Co. He was a young mining engineer, who promised to take a high place in his profession, and his many friends learn with regret of his early demise.

## McINTYRE.

Toronto, Sept. 9.

It is announced in local mining circles to-day that the deal for control of the McIntyre Gold Mines, of Porcupine, which has been pending for some time, has at last been closed, and that capitalists associated with the Nipissing mine are now practically in control of the McIntyre.

The necessary stock, \$1,500,000 shares, has been deposited in escrow, and will be paid for should the examination of the McIntyre property verify the statements that have been made by the vendors.

It is understood that in addition to buying a controlling interest in stock, the new owners have taken from President Freeman \$90,000 worth of bonds, and that only on this basis could the deal have been put through.

Reports from the McIntyre have been very favorable of late, and it is the expectation that the new control will bring to the stock prestige which it has hitherto lacked.

## A PICKING TABLE SCREEN.

Roberts and Schaefer Co., engineers and contractors, have issued a bulletin illustrating and describing the Marcus patent picking table screen. This screen marks a decided step in advance in the preparation of coal. Not only does it size the coal as well or better than had been done by means of the inclined shaking screen, but it also permits the hand picking and removal from the coal of all foreign matter.



## SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

Efforts are being made to bring about a return to conditions as nearly normal as shall be found practicable in connection with the production of silver and lead bearing ores, particularly in the mining divisions of West Kootenay—Ainsworth, Slocan, and Nelson—that are most seriously affected by the interruption to production following disorganization of the metal markets consequent on the outbreak of war in Europe. Following the vigorous steps taken to prevent a continued interruption to silver mining in Ontario, Mr. Lorne A. Campbell, M.L.A., of Rossland, general manager for the West Kootenay Power and Light Co., in whose electoral constituency is situated Trail, the headquarters of the Consolidated Mining and Smelting Company of Canada's lead smelting and refining and copper smelting industry, actively interested himself in an energetic movement to minimize the unfavorable results of a stoppage of mining operations at a number of mines in the several divisions above mentioned. After having been in communication with the Premier of British Columbia, who is also Minister of Mines for the Province, Mr. Campbell proceeded to Victoria. The following information relative to his visit to the capital of the Province was published in the *Victoria Daily Colonist* of August 27:

"Strenuous efforts are being made by the mining interests of British Columbia, particularly those in the Kootenay districts, to devise ways and means to meet the new situation as a result of the war, and insure that the producing properties of the country shall not have to discontinue mining operations. To this end several conferences have been held during the last two days between Sir Richard McBride and Mr. Lorne A. Campbell, M.L.A. for Rossland, representing the mining interests of Kootenay.

"In explanation of the position of the silver-lead mining industry, Mr. Campbell said: Prior to the outbreak of war, the mines were in good condition and there were but few clouds on the industrial horizon of the Kootenay districts. With the war and the immediate collapse of order in the financial markets throughout the world, came the disruption of the metal markets, making it impossible to get quotations or ascertain the market value of metals. This situation only revealed an opportunity, as a result of the war, and it is this new position that is now being surveyed.

"Just prior to the outbreak of war, Great Britain secured all the available lead supplied open to purchase. It is assumed that she is still in the market for all the lead she can get. The silver-lead mines of British Columbia produce comparatively very little silver, but they do produce a considerable quantity of lead, which can be refined in the Province. It is to this phase of the matter Mr. Campbell is now engaged in directing the attention of both the Federal and Provincial Governments. His idea is, roughly, that the Federal Government should purchase what silver is produced in British Columbia and make what other arrangements shall be necessary to insure that the mines shall not be closed, to the end that the lead which Great Britain requires shall be supplied in some quantity by the mines of this Province. The question is one which involves many considerations, but Mr. Campbell has received such assurances from Sir Richard Mc-

Bride as lead him to be hopeful that the problem will be solved satisfactorily."

It is of interest in this connection to note that in 1913 the silver-lead-zinc mines of Kootenay districts produced, according to official figures approximately 2,800,000 oz. of silver, 55,000,000 lb. of lead, and 6,758,000 lb. of zinc.

## Ainsworth.

Mining is being continued on a number of properties in this division. During four weeks ended Aug. 27, 1,854 tons of ore from local mines was received at the Consolidated Co.'s smelting works at Trail, chiefly from the company's own mines, the Highland and No. 1.

At the Silver Hoard mine 12 men are employed, and ore is being taken out. While operations are on a smaller scale than had been intended they should be, the Spokane owners of this property are continuing work with fewer men rather than close the mine. As soon as custom ore shall again be received at Trail shipment will be resumed; meanwhile the ore taken out as development proceeds is being stored at the mine.

Work has been discontinued at the Eureka mine, near Sproules, a stopping place on the Kaslo & Slocan railway. The crosscut adit that for some time was being driven under contract did not open any ore. A few men have been sent from Kaslo to the J. L. Retalack & Co. property near Whitewater to work there for a while, but it is unlikely they will remain there many weeks.

## Boundary.

**Granby Consolidated**—President Nichols, of the Granby Consolidated Mining, Smelting and Power Co., Ltd., has issued to shareholders in the company a circular letter, as follows:

"We suppose that no shareholder will be surprised to learn that the directors of the company have unanimously decided to defer action on the question of a dividend under the unprecedented conditions prevailing at this time, when there is no market for refined copper.

"It seemed plain that working for a large output which could not be sold would be very unwise, as it would only postpone the time when normal prices might be resumed. Accordingly the works at Phoenix and Grand Forks were closed on August 7.

"The entire energies of our staff are now concentrated at Anyox, where metal recoveries and value are much higher than at the old mines and smelter.

"The problems involved in accomplishing the most efficient and profitable handling of our business in this new field can now receive the undivided attention of the management.

"If this interval of reduced activity, made necessary by the war in Europe, can be utilized to place the company in position to reap the greatest possible advantage from improved conditions, when they arise, the company will accomplish the most that could be wisely attempted. The spirit of the management is admirable, and every effort will be made to convert the temporary conditions, for which neither the property nor its management is in any wise responsible, into permanent benefit to the company."



Commenting on this communication to the shareholders, Mr. Geo. L. Walker says: "The Granby Consolidated Co.'s mines at Phoenix and smelter at Grand Forks are idle, and the management's attention is being given exclusively to the Hidden Creek operations, where, it is understood, a fair operating profit can be shown even with copper selling around 12½ cents a lb. The cost of producing copper at Phoenix and Grand Forks was probably around 11 cents a lb. As the company was obliged to borrow a large sum of money to complete its Hidden Creek financing, it is not in a position to continue production at full volume under present conditions, which probably would entail the necessity of accumulating a considerable stock of copper. To accumulate 10,000,000 lb. of metal, costing 11 cents a lb., would tie up \$1,100,000, and this would severely strain the cash resources of a company in such a position as the Granby Co. is in. The management has wisely passed the dividend, which under normal conditions would have been paid this quarter. There is little doubt that it will be able to make sufficient profit from its Hidden Creek operations to pay the interest on its outstanding bonds and notes. With the return of normal conditions in the metal market, and an advance of three or four cents per lb. in the price of copper, the Granby Co. will be in a position to earn \$2,000,000 to \$3,000,000 annually. Given those conditions it will be able to liquidate its floating indebtedness very quickly."

#### Coast.

**Portland Canal Tunnels, Ltd.**—Recently there was printed in the Journal information relative to progress made in the mine of the Portland Canal Tunnels, Ltd., near Stewart, Portland Canal mining division, and it was stated that the main crosscut adit being driven by the company had by August 6 reached a distance of 3,534 ft. from its portal. It was also shown that at 2,343 ft. from the mouth of the adit the Lucky Boy vein had been intersected, at 2,600 ft. the Melba vein was reached, and at about 3,000 ft. the Richard II. vein was cut; further, that the Lucky Boy drift was in 530 ft., and that a raise from this drift to connect with the surface was up 90 ft. with about 70 ft. more to be put up before the raise would be through. Since then encouraging progress has been made. On August 24 General Manager Elmendorf telegraphed from Stewart to the company's office in Victoria, to the effect that the crosscut had reached what is known as the green vein. Five days later he advised that the whole face of the adit was in ore of good mill feed grade, and that a sample that had that morning been assayed contained 18 oz. silver to the ton, with gold not yet determined, and some lead. This ore was encountered at about 2,000 ft. below the surface, and its having been proved to occur at that depth is regarded as of much importance to Portland Canal mining division.

#### WESTERN NATURAL GAS CO.

The directors of the Canadian Western Natural Gas Light, Heat & Power Co., Ltd., have placed the shares on a dividend paying basis by the declaration of an interim dividend of 1 per cent., payable August 31. Books will close from August 25 to August 31 inclusive.

The company, which owns a number of natural gas wells in Southern Alberta, supplies gas to Calgary and Lethbridge, with branch lines to other towns. The gas bearing territory controlled covers over one and

a half million acres. The authorized capital is \$8,000,000 in common and an issue of 3,950,000 in 5 per cent. debenture stock was made in London a couple of years ago.

#### PRETORIA MINT TO BE REOPENED.

Pretoria, Aug. 9.

It is officially announced that the Government is temporarily reopening the Pretoria Mint used by the old Transvaal Republican Government for coining South African sovereigns and half-sovereigns. Work is already proceeding in connection with the overhauling of the plant and equipment, and operations will be commenced as soon as possible. The Government's decision is the outcome of a desire to ensure that under no circumstances shall the supply of gold and specie in the Union fall below local requirements. The gold and specie now in the country are sufficient for the Union's needs for a considerable time to come, but it is desirable to make arrangements to supplement the existing gold supplies in case a scarcity should occur.

#### REA MINE.

According to Mr. S. R. Clarke, the Rea mine has shown that a gold mine in Porcupine can be made to pay very handsomely with a comparatively small initial outlay. The Rea's 10-stamp amalgamating mill cost only \$5,000. It crushes 35 tons daily and saves 89 per cent. of the gold, and the monthly return is over \$15,000.

The mills of the Dome and Hollinger have a much greater capacity and a more complete recovery; still the example of the Rea should do much to secure the opening of many properties for which large capital is not now available. The war has shown the extraordinary value of gold, and there is nothing much safer or more profitable now than a producing gold mine.

#### RAY AND NEVADA.

The Ray Consolidated Copper Co. and the Nevada Consolidated Copper Co. have voted to defer action for the time being on the payment of the dividends.

In a letter to stockholders of the Nevada Consolidated Copper Co., explaining deferment of dividends, President Eccles stated as follows:

"The general European war has precipitated a condition which has led to the derangement of markets, transportation and financial facilities in the copper industry. Under normal conditions about 50 per cent. of the copper produced in the United States is marketed abroad, and with the declaration of war this outlet for the copper has become closed for the reasons set forth above. When this condition became apparent your directors determined to curtail operations, and your mines, mill and smelter are now operating on only 50 per cent. capacity."

Political partisans of Felix Diaz have revolted in Oaxaca and other districts in southern Mexico and are in arms against Gen. Carranza's Government, according to information received in New York Tuesday.



## COBALT SHIPMENTS.

The one feature in the Cobalt situation is the holding back of silver bullion until such times as the market is less limited and transportation is still more secure.

The arrangements with the smelters appear to be working satisfactorily as ore shipments continue well above normal. The Cobalt Townsite was a very large shipper with no less than four cars of high grade ore and concentrates. The English company is piling up a record production for the year. The McKinley-Daragh were next in importance with three cars and there is every disposition on the part of this company to maintain full production as long as possible.

The Dominion Reduction company has recommended its shipments of cobalt residue to the Canadian smelter, so that it may be inferred that this class of ore can again be transported across the seas. A large tonnage of ores containing a high percentage of cobalt has been held at Canadian smelters awaiting transportation since the war broke out.

The ore shipments from the Cobalt camp for the week ending Sept. 11, were:

	High.	Low.	Tl. Lb.
Cob. Townsite. . . .	330,180	.....	330,180
McKin.-Dar. . . . .	258,020	....	258,020
La Rose . . . . .	85,090	.....	85,090
Cham.-Fer. . . . .	76,560	.....	76,560
Cobalt Lake . . . .	64,060	.....	64,060
Dom. Red. . . . .	.....	84,900	84,900
Coniagas. . . . .	74,310	.....	74,310
	888,120	84,900	973,020

The bullion shipments from the Cobalt camp for the week ending Sept. 11, were:

	Bars.	Ounces.	Value.
Cr. Reserve. . . . .	57	66,000.00	\$35,000.00
Penn-Can. . . . .	3	2,631.44	1,420.98
	60	68,631.44	\$36,420.98

The bullion shipments for the year to date are as follows:

	Ounces.	Value.
Nipissing. . . . .	2,355,066.61	\$1,956,384.63
(and Customs ore)		
Dom. Red. . . . .	241,041.00	141,612.25
Buffalo. . . . .	791,319.77	454,249.50
Cr. Reserve . . . . .	389,375.00	215,452.00
O'Brien. . . . .	101,269.05	57,476.46
Kerr Lake . . . . .	54,944.75	28,133.74
McKin.-Dar. . . . .	12,176.00	6,356.00
Foster Ls. Co. . . .	2,187.25	1,141.44
Penn. Can. . . . .	9,237.94	5,887.88
Casey Cobalt . . . .	2,893.00	1,484.00
Trethewey . . . . .	2,000.00	1,200.00
Timiskaming. . . . .	1,951.00	1,033.05
Bailey. . . . .	1,462.00	763.25
Hargraves. . . . .	794.00	414.81
City of Cobalt . . .	24,121.00	13,616.00
Caribou Cobalt . . .	67,972.99	5,714.75
Cobalt Townsite . .	26,933.00	14,766.00
Campbell & Deyell	500.00	295.00

Total. . . . . 4,862,189.33 \$2,745,758.62

## GEO. S. MALLOCH DEAD.

Washington, Sept. 14, 1914.

After being marooned on frozen Wrangels' Island in the Arctic since last January, eight white men and an Eskimo, the remnant of Stefansson's ship Karluk, arrived at Nome, Alaska, on board the United States revenue cutter Bear. Eight members of the expedition failed to reach the island when the Karluk was crushed and three others, George S. Malloch, a native of Hamilton, chief geologist; John Broeddy, seaman, and Bjarme Mammen, assistant topographer, died on the island.

George Malloch was born at Hamilton 34 years ago. After receiving his early education at Upper Canada College, he took a science course at Queen's University, Kingston, graduating in 1902 with the degrees, A.B., and also B.Sc. at the School of Mining in 1906. After graduation he was appointed assistant geologist to the Geological Survey. He spent the following two years in research work in the coal fields of Alberta. In 1909 he pursued his work between the Fraser River and Fort George. The next three years were spent in topographical work in British Columbia. Before joining the expedition as chief geologist and topographer, Mr. Malloch took a post-graduate course at Yale University.

A despatch received from Captain Cochran, of the revenue cutter, says that Malloch and his assistant, Mammen, died of nephritis, while Broeddy was accidentally shot.

Continuing, the despatch says that the survivors, John Munro, Robert Williamson, W. McKinley, John Hadley, E. F. Chaff, R. Templeman, H. Williams, F. W. Maureer, and Eskimos are doing well under the care of the surgeon.

"Party were rescued by the schooner King and Wing, September 7," says the telegram. "Transferred to the Bear, September 8. Bear reached within 12 miles of Herald Island. Clear weather and heavy ice. Unable to land on island, but no signs of life."

The expedition started out about a year ago, under the auspices of the Canadian Government, for the purpose of exploring land north of Point Barrow. During a fog Stefansson and several others went ashore in a boat and the Karluk was carried away from them. Messages since received from him show that he and the other members of his party are alive and conducting the explorations.

When the Karluk was crushed the party saved as large an amount of stores as possible. The eight men reported missing probably lost their lives in making the trip to Wrangel Island.

## VIPOND GOLD MINE.

The Vipond Gold Mines Company has completed its new mill, and this is now running satisfactorily. With the installation of the new machinery a very high grade extraction should be obtained. Underground work is being carried out as extensively as possible and there is said to be enough ore drawn to keep the mill going a considerable time.

## MARKETS

## TORONTO MARKETS.

September—

Sept. 9—(Quotations from Canada Metal Co., Toronto)—

Spelter, 6c. per lb.

Lead, 5c. per lb.

Tin, 45c. per lb.

Antimony, 16c. per lb.

Copper, casting, 14c. per lb.

Electrolytic, 14c. per lb.

Ingot brass, yellow, 10c per lb.; red, 13c. per lb.

Sept. 9—Coal (Quotations from Elias Rogers Co., Toronto)—

Anthracite, \$7.75 per ton.

Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Sept. 8—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, \$1.70 to \$1.75 per ton.

Foundry coke, prompt, \$2.25 to \$2.35 per ton.

Sept. 8—Tin, straits, 34.00 cents.

Copper, Prime Lake, 12.50 to 12.75c.

Electrolytic copper, 12.20 to 12.30c.

Copper wire, 13.75 to 14.00c.

Lead, 3.90c.

Spelter, 5.85c.

Sheet zinc (f.o.b. smelter), 8.50c.

Antimony, Cookson's, 13.50 to 14.00c.

Aluminum, 19.50 to 20.50c.

Nickel, 40.00 to 45.00c.

Platinum, soft, \$48.00 to \$50.00 per oz.

Platinum, hard, 10 per cent., \$52.00 to \$54.00 per oz.

Bismuth, \$3.00 per lb.

Quicksilver, \$70.00 to \$75.00 per 75-lb. flask.

## SILVER PRICES.

	New York cents.	London pence.
August—		
25 . . . . .	53½	*
26 . . . . .	54½	*
27 . . . . .	55	*
28 . . . . .	53½	*
29 . . . . .	53	*
31 . . . . .	53¾	*

1 . . . . .	53¼	*
2 . . . . .	53¼	*
3 . . . . .	53¼	24
4 . . . . .	53½	24¼
5 . . . . .	53½	24¼
7 . . . . .	†	24½
8 . . . . .	54¾	24½
9 . . . . .	54¾	24½
10 . . . . .	55	25
11 . . . . .	55	25

\*No quotations. †Holiday.

## STANDARD EXCHANGE.

Sept. 11, 1914.

Following are yesterday's quotations on the Standard Stock and Mining Exchange:—

	Asked.	Bid.
Cobalt.		
Bailey . . . . .	5½	¾
Beaver . . . . .	20	18¾
Buffalo . . . . .	..	75
Chambers . . . . .	..	10
Cobalt Lake . . . . .	50	..
Coniagas . . . . .	..	6.50
Crown Reserve . . . . .	1.15	1.10
Gould . . . . .	1	½
Great Northern . . . . .	4¼	..
Hargraves . . . . .	2	..
La Rose . . . . .	..	425
Little Nipissing . . . . .	..	70
McKinley . . . . .	40½	..
Nipissing . . . . .	5.25	4.95
Peterson Lake . . . . .	23¼	..
Timiskaming . . . . .	8	7½
Trethewey . . . . .	15	..
Wettlaufer . . . . .	..	5
Porcupine—		
Crown . . . . .	85	75
Dome Extension . . . . .	5½	5
Dome Mines . . . . .	18.00	16.40
Jupiter . . . . .	..	5¼
McIntyre . . . . .	35	28
Preston . . . . .	1¼	¼
Rea . . . . .	..	10
Vipond . . . . .	17¼	..

## SALES.

	High.	Low.	Last.	Sales.
Cobalt.				
Bailey . . . . .	½	..	..	500
Crown Reserve . . . . .	1.14	..	..	100
Nipissing . . . . .	5.05	..	..	40
Timiskaming . . . . .	7¾	..	..	1,000
Porcupine—				
Wettlaufer . . . . .	5½	..	..	500
Dome Extension . . . . .	5¼	..	..	10
McIntyre . . . . .	28	..	..	250





## Supplies for the Mine

In the mine, equipment such as Belting, Hose, etc., is put to extremely severe tests.

Buying equipment on mere price is poor economy, especially in mines where more than mere service is vital.

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

#### REPORTS RECENTLY ISSUED:

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##### ONTARIO

Memoir 33. Geology of Gowganda Mining Division, by W. H. Collins.

##### NORTH-WEST PROVINCES

Memoir 30. The basins of Nelson and Churchill rivers, by William McInnes. Map not published.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

##### BRITISH COLUMBIA

Memoir 23. Geology of the coast and islands between the Strait of Georgia and Queen Charlotte Sound, B.C., by J. Austen Bancroft.

Memoir 36. Geology of the Victoria and Saanich Map areas, Vancouver Island, B.C., by Chas. H. Clapp. Maps not published.

##### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

#### MAPS RECENTLY ISSUED:

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Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.

Map 39A. Geological Map of Nova Scotia.

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Map 106A. Groundhog coal field, British Columbia. Geology.

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Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

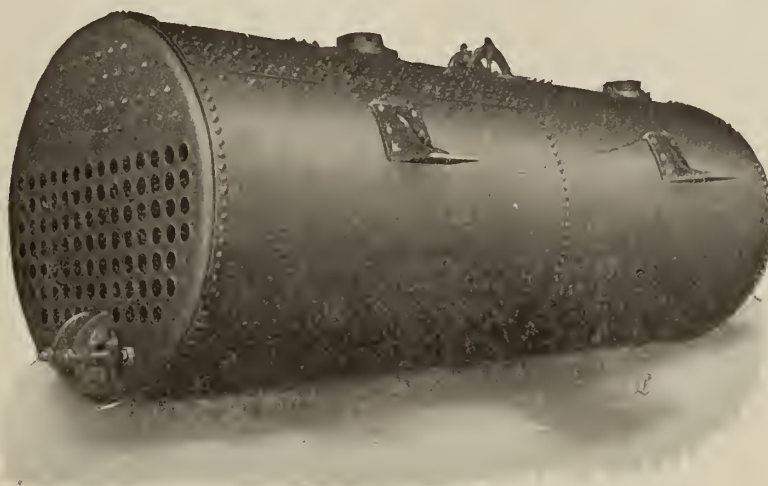
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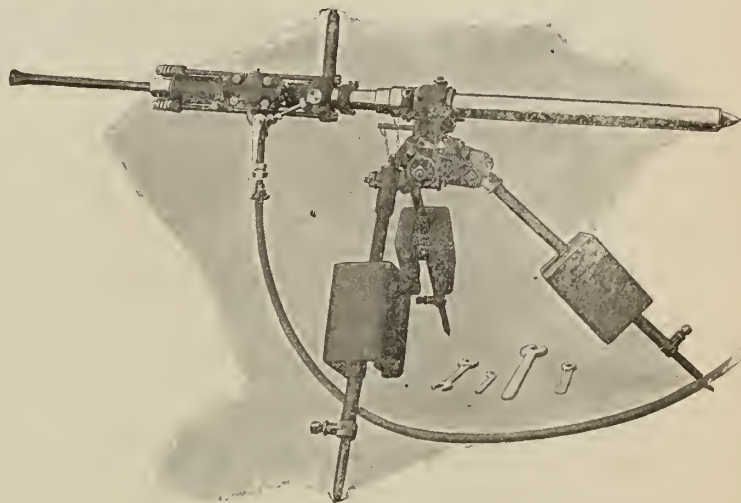
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The output of the mines and metallurgical works of Ontario for the year 1912 was valued at \$48,341,612, and for 1913 this amount will be materially increased.

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water.

A miner's license costs \$5.00 per annum, and entitles the holder to stake out three claims a year in every mining division.

For maps, reports of the Bureau of Mines, and mining laws, apply to

**HON. W. H. HEARST,**

Minister of Lands, Forests and Mines,

**Toronto, Canada.**



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Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

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Ledoux & Co., 99 John St., New York

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Peacock Bros.

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Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
The John Inglis Co., Ltd.

## Beams—Steel—

Canadian Allis-Chalmers, Ltd.  
Dominion Bridge Co.  
Mussens, Ltd.

## Beltting—

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Mussens, Ltd.  
Northern Canada Supply Co.  
Jones & Glassco  
Canadian Fairbanks-Morse  
Federal Engineering Co.,  
G. Taylor Hardware Co., Ltd.

## Blasting Batteries and Supplies—

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Thomas & William Smith  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada), Limited.  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Blowers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

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Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
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Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.

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Canadian Allis-Chalmers, Ltd.

## Cable — Aerial and Under-ground—

Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

## Cableways—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Cages—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Jenckes Machine Co., Ltd.

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Northern Electric Co., Ltd.  
Standard Underground Cable Co. of Canada, Ltd.

## Canvas—

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G. Taylor Hardware Co., Ltd.

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Abe. Levine

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Mussens, Ltd.  
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## Cement Machinery—

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Canadian Allis-Chalmers, Ltd.  
Jenckes Machine Co., Ltd.  
Northern Canada Supply Co.  
Peacock Bros.

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Jeffrey Mfg. Co.  
Peacock Bros.  
Jones & Glassco  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co.

B. Greening Wire Co., Ltd.

Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Chain Blocks—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

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Campbell & Deyell  
Thos. Heys & Son  
Milton Hersey Co.  
Ledoux & Co.

## Coal—

Dominion Coal Co.

Nova Scotia Steel & Coal Co.

## Coal Cutters—

Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.

## Coal Handling Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Coal Mining Explosives—

Curtis & Harvey (Can.), Ltd.

## Coal Mining Machinery—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Jeffrey Mfg. Co.

## Coal Puncturers—

Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.

## Coal Washeries—

Jeffrey Mfg. Co.  
Mussens, Ltd.  
Peacock Bros.

## Compressors—Air—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Canadian Allis-Chalmers, Ltd.  
Canadian Westinghouse  
Can. Ingersoll-Rand Co. Ltd.  
Cleveland Pneumatic Tool Co. of Canada, Ltd.

Mussens, Ltd.

Peacock Bros.

Northern Canada Supply Co.

The John Inglis Co., Ltd.

## Concentrators and Jigs—

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Fraser & Chalmers, Ltd.  
James Ore Concentrator Co.  
Mussens, Ltd.  
Canadian Fairbanks-Morse  
Jenckes Machine Co., Ltd.

## Concrete Mixers—

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Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Condensers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

## Converters—

Canadian Westinghouse  
Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Mussens, Ltd.

## Conveying Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Conveyor—Trough—

Hendrick Mfg. Co.

## Cranes—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
M. Beatty & Sons, Ltd.

## Cranes—Electric—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Cranes—Overhead Traveling—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Crane Ropes—

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Allan, Whyte & Co.  
Thos. & Wm. Smith  
B. Greening Wire Co., Ltd.  
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## Crushers—

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## Derricks—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Diamonds (for Diamond Drills)—

Abe. Levine

## Diamond Drill Contractors—

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Smith & Travers.

## Dredging Machinery—

Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.

## Dredging Ropes—

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Fraser & Chalmers, Ltd.  
B. Greening Wire Co., Ltd.

## Drills, Air and Hammer—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Drills—Core—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.

## Drills—Diamond—

American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.

## Drill Steel Sharpeners—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Mussens, Ltd.

## Drills—Electric—

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Mussens, Ltd.  
Siemens Co. of Canada, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

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Mussens, Ltd.  
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Mussens, Ltd.  
Siemens Co. of Canada, Ltd.

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Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.

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Northern Electric Co., Ltd.

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Mussens, Ltd.

## Elevating and Conveying Machinery—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Ejectors—

Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.

## Elevators—

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Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
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Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.

## Engines—Marine—

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Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Oil—

Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

## Engines—Steam—

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S. Flory Mfg. Co.  
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## Fans—Ventilating—

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## Canadian Miner's Buying Directory.—(Continued from page 28.)

- Furnaces—Assay—**  
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- Hangers—Cable—**  
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Co. of Canada, Ltd.
- Hand Hoists—**  
The Herbert Morris Crane &  
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- Heaters—Feed Water—**  
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Peacock Bros.  
Fraser & Chalmers, Ltd.  
G. Taylor Hardware Co., Ltd.
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Northern Canada Supply Co.
- Hoists—Air Electric and  
Steam—**  
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Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Siemens Co. of Canada, Ltd.
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Pneumatic—**  
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Hoist Co., Ltd.
- Hoisting and Conveying Mach-  
inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.
- Hoisting Engines—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Sullivan Machinery Co.  
Fraser & Chalmers, Ltd.  
Can. Ingersoll-Rand Co.
- Hoists—Gas and Gasoline—**  
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Mussens, Ltd.
- Hose—**  
H. W. Johns-Manville Co.  
Mussens, Ltd.  
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Can. Cleveland Drill Co.  
Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
- Jacks—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Jigs—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.
- Lamps—Acetylene—**  
Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Northern Canada Supply Co.
- Lamps—Safety—**  
Mussens, Ltd.  
Canadian Explosives  
Peacock Bros.  
Ackroyd & Best
- Link Belt—**  
Waterous Engine Works  
Northern Canada Supply Co.  
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- Locomotives—Electric—**  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Canadian Westinghouse
- Locomotives—Steam—**  
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- Metal Merchants—**  
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Smelting Co. of Canada  
Canada Metal Co.
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Orford Copper Co.
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Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell
- Ores and Metals—Buyers and  
Sellers of—**  
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Consolidated Mining and  
Smelting Co. of Canada  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pick Machines—**  
Sullivan Machinery Co.
- Picks—Steel—**  
Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Thos. & Wm. Smith  
Peacock Bros.
- Pipes—**  
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Peacock Bros.  
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Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
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- Pipe Fittings—**  
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Mussens, Ltd.  
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Northern Canada Supply Co.  
Geo. Taylor Hardware Co., Ltd.
- Pneumatic Chain Blocks—**  
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Hoist Co., Ltd.
- Pneumatic Tools—**  
Can. Cleveland Drill Co.  
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- Producer—Gas—**  
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Peacock Bros.  
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M. Beatty & Sons  
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Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.
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Ltd.  
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## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$72,194,603; Lode Gold, \$70,859,022; Silver, \$33,863,940; Lead, \$27,520,753; Copper, \$73,723,562; Other Metals (Zinc, Iron, etc.), \$1,528,403; Coal and Coke, \$132,871,155; Building Stone, Brick, etc., \$17,576,084; making its Mineral Production to the end of 1912 show an

## Aggregate Value of \$430,137,522

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1892, inclusive, \$81,090,069; for five years 1893-1897, \$31,420,396; for five years 1898-1902, \$77,218,073; for five years 1903-1907, \$109,797,744; for five years 1908-1912, \$130,611,240.

## Production During last ten years, \$240,408,984

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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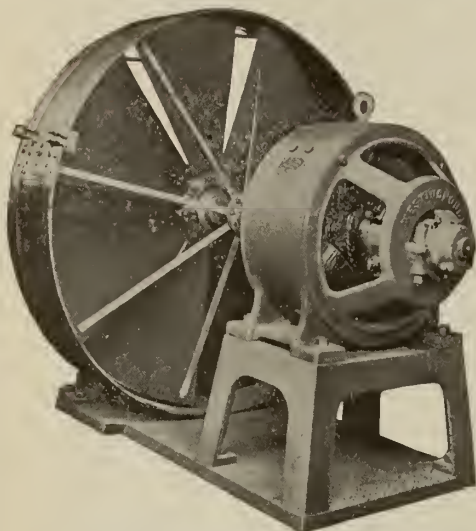
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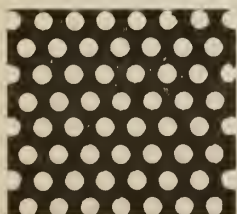
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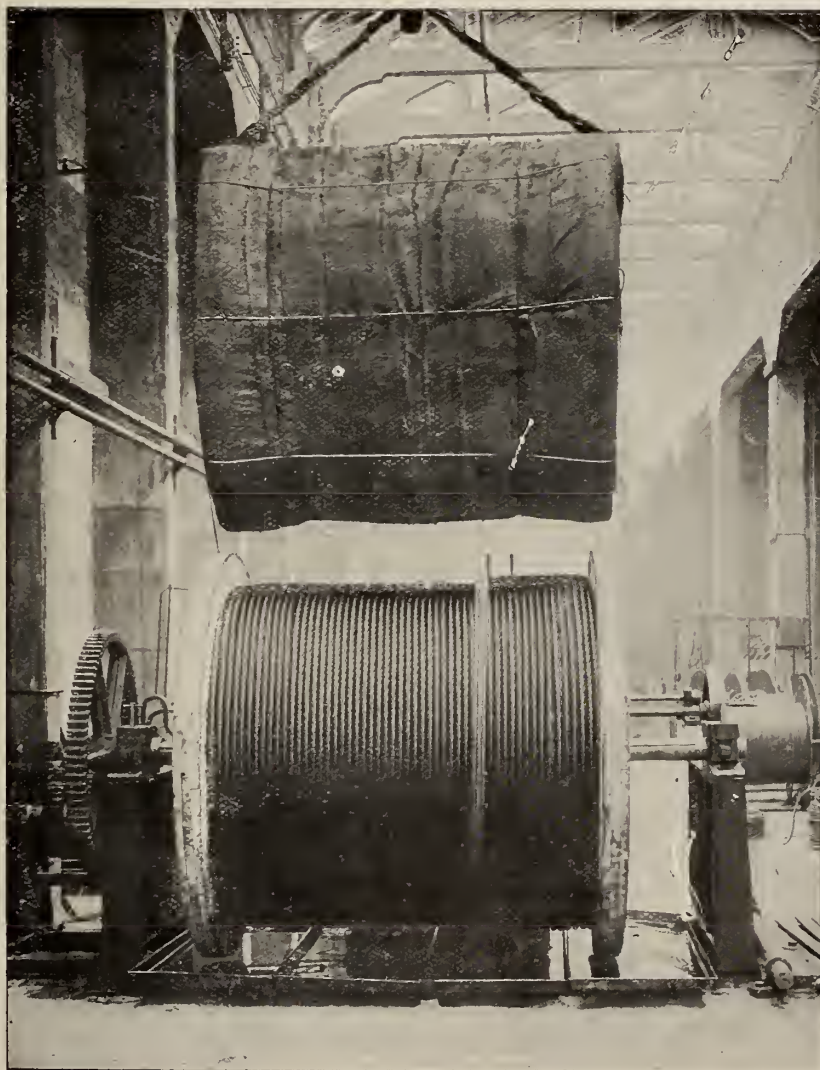
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AND

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# **CANADIAN** **MINING JOURNAL**

VOL. XXXV

TORONTO

No. 19

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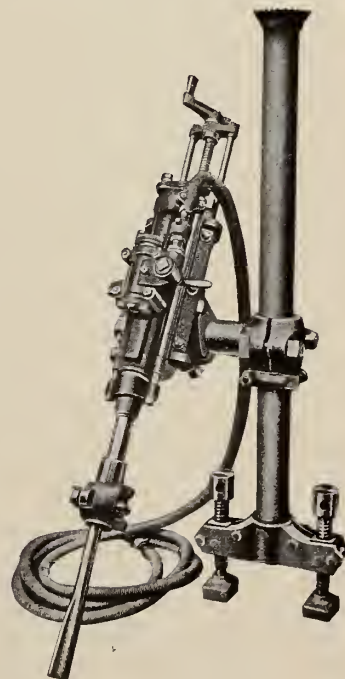
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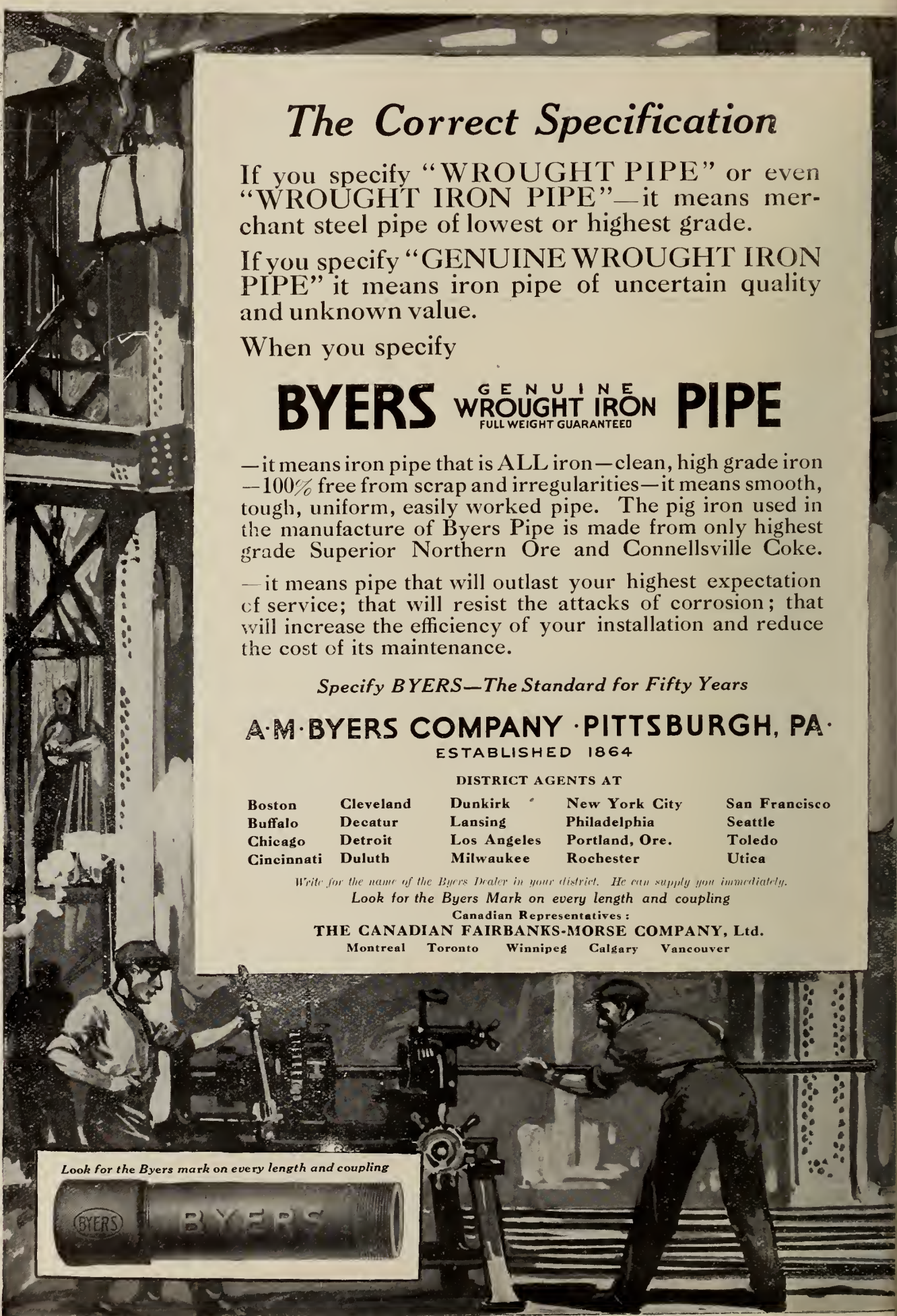
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Sullivan Stoppers spend their time at work, and not in the repair shop. Men who have used them for one year, two years, three years and longer, find that these drills are "as good as new"—drill practically as fast, take as little air, as when put into the mine first.

### HERE IS A SAMPLE REPORT:

"The——Mine, in——, Mexico operates 27 Sullivan Stoppers. During a single month, they drilled 43,000 feet of hole. The cost for labor and repairs on the 27 drills was three-tenths of a centavo per foot of hole drilled (15 cents per hundred feet.)"

In addition to standard drills, for ordinary conditions, there are "Sullivan Soft Ground Stoppers" "Sullivan Hard-ground Stoppers," "Sullivan Air Jet Stoppers." A water spray for laying dust may be supplied on any of these tools.

Why they "stay" is discussed in Bulletin 666-G. Ask for it.

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# DRIFTING

## WITH THE

# "JACKHAMER"

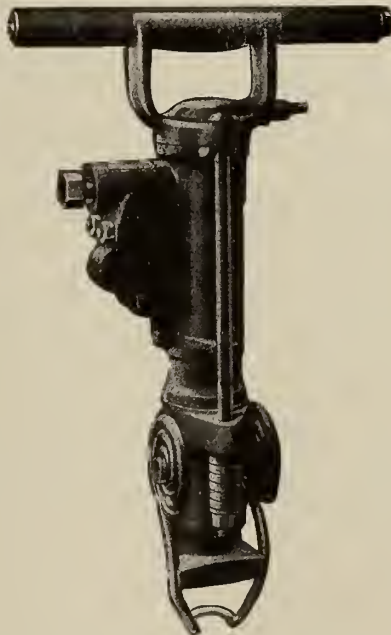
As evidence of how some mines appreciate the general utility of the "JACKHAMER" and make use of it to great advantage for work hitherto done by far more expensive methods the following drifting record should be of interest to mine managers.

The following is an actual report of the drifting done by a large copper company in its medium sized drifts with the "JACKHAMER."

"With one "JACKHAMER" 157½ feet were made in 28 shifts of eight hours each, or 5 feet 10 inches per shift. The miner was given three headings of close proximity in which to drill and when one round was finished he would proceed to another face drilling until shooting time. Usually two complete rounds were drilled and blasted in a shift. No drill support of any kind was used. The miner held the drill against his body and stood on the muck pile to reach the back and breast holes. The ground was medium porphyry and required 7 to 8 holes to break, so you can readily see it was not very soft."

### A Few "JACKHAMER" Features

- Self-rotation
- Self-lubrication
- All Steel Construction
- Non-freezing Butterfly Valve
- Effective Hole-cleaning Device
- Convenient Steel Holder
- Operates on Air or Steam



### A Few Uses in Mining

- Bench Work
- Ditch Digging
- Drilling Hanger Holes
- Hitch Cutting
- Shaft Sinking
- Tunnel Trimming
- Wall Trimming
- Drifting

THE "JACKHAMER" IS A GENERALLY USEFUL ONE-MAN TOOL OF GENUINE MERIT. WHY NOT TRY ONE ON YOUR OWN PROPERTY?

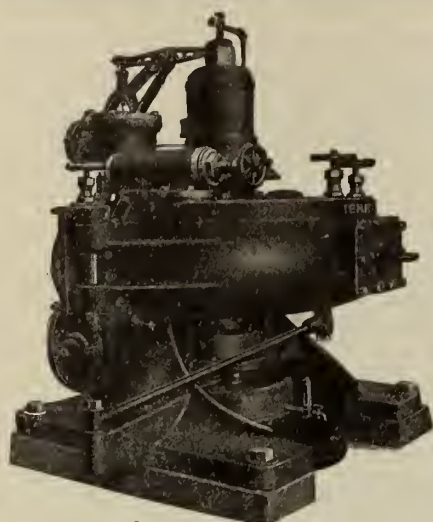
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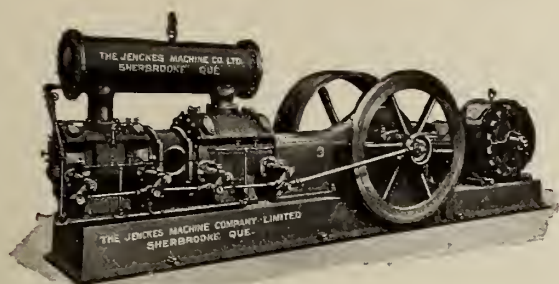
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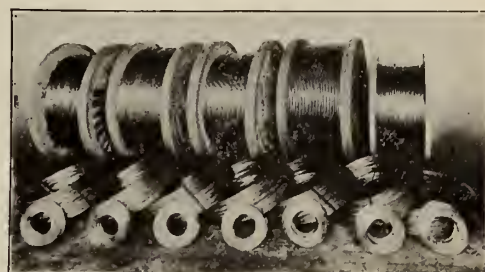
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The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

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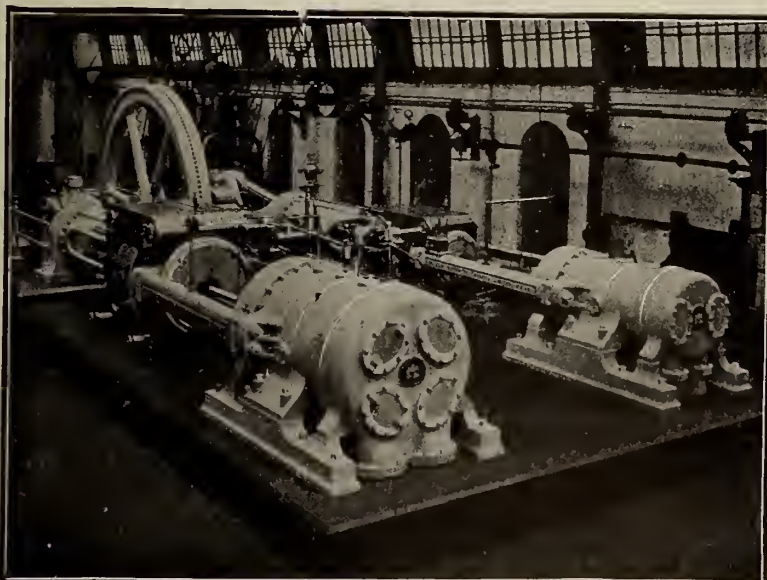
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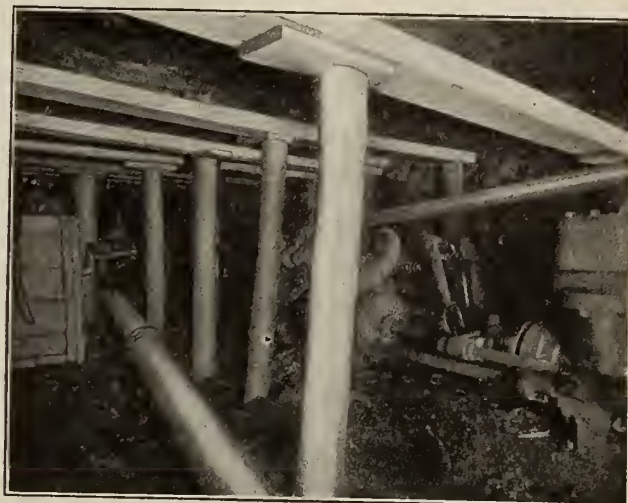


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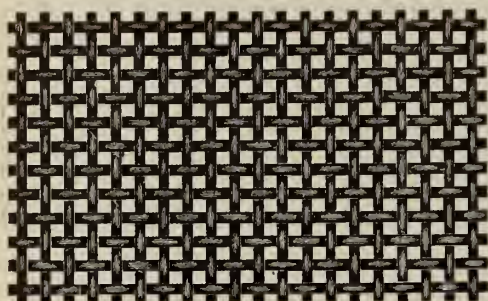
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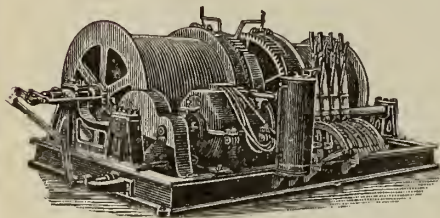
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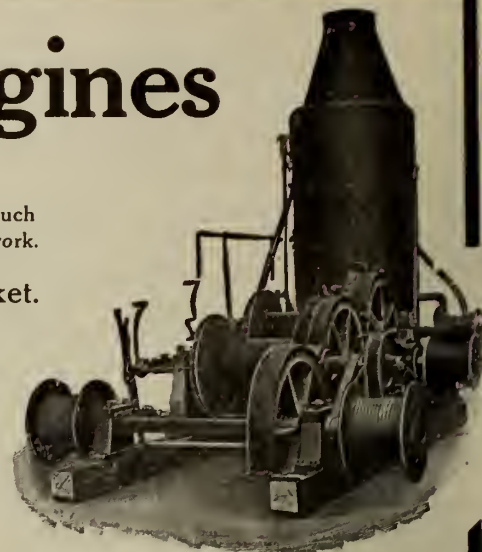
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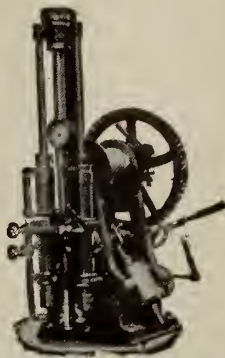
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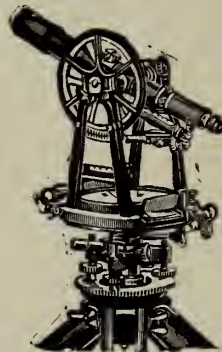
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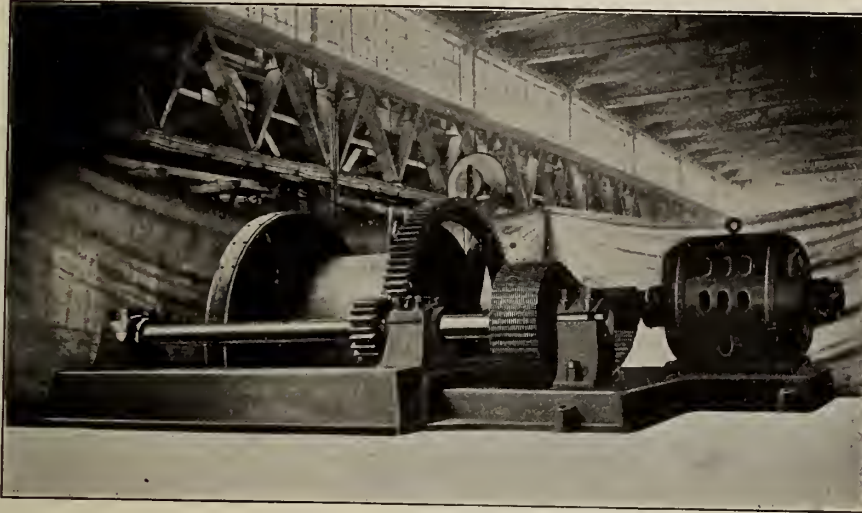
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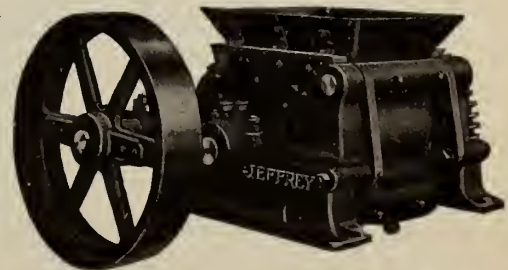
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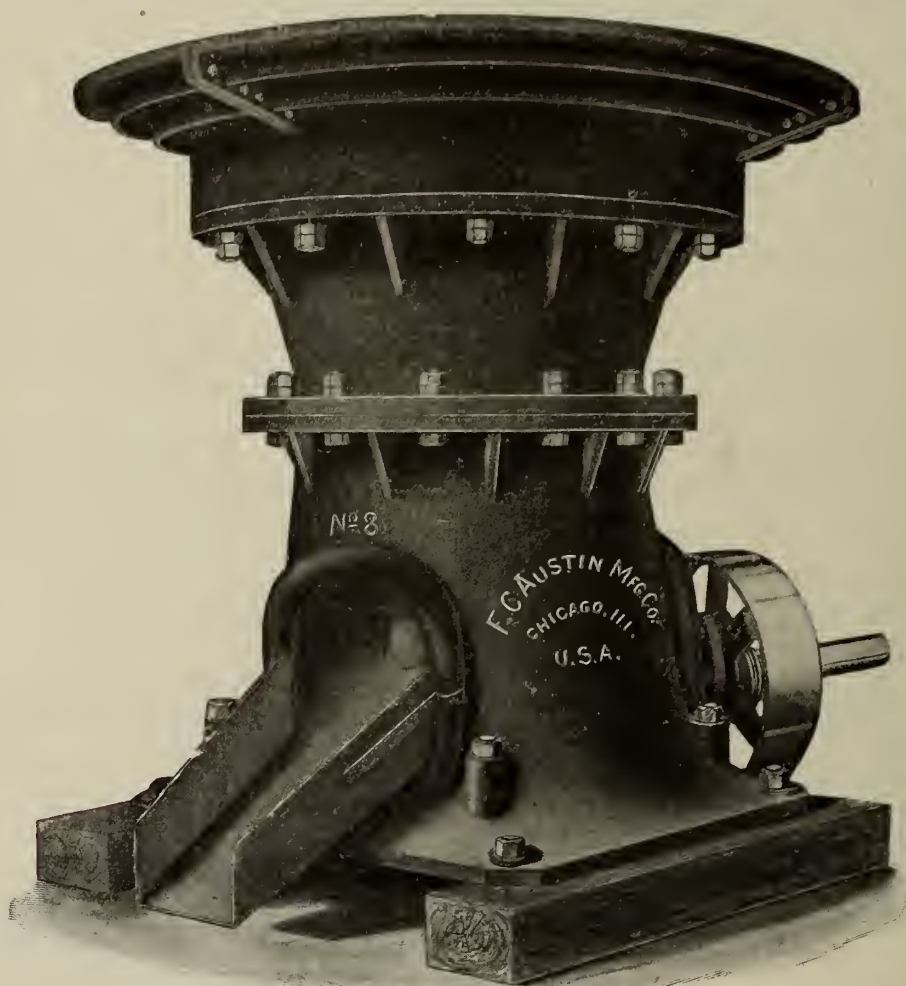
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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, October 1, 1914.

No. 19

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office . . . 2nd Floor, 44 and 46 Lombard St., Toronto  
Branch Office . . . 600 Read Bldg., Montreal.  
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### CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd, 1879."

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## ENGLISH FOR ENGINEERING STUDENTS

It is not an uncommon thing for an engineer to express regret that in his student days he spent so little of his time in the study of English. Occasionally an engineer goes further and urges that something be done to provide for better training for the engineers of the future. Some who have had occasion to feel their deficiency keenly are heard to criticize severely the colleges which send them out under a serious handicap. A few make suggestions as to just what should be done at the colleges where they were trained.

In recognition of the lack of training in writing which the average mining engineer has had, the Michigan College of Mines in 1911 engaged an English instructor, Mr. J. D. Black, and offered a course in technical writing. An interesting account of the result of three years' work is given by Mr. Black in a recent paper. First, regarding the student's standpoint, he says:

"How is it at the College of Mines after three years of the work? I do not think that the courses are any less popular here than in other engineering schools in the country; in fact, I think they are more popular. And I am not claiming much popularity at that! Some of the students think that the courses are a nuisance; others say that the work is useless, that they don't seem to be getting anywhere with it. Both of these sorts let the work trouble them just enough to escape a condition. Others say that perhaps a course in technical writing could be given that would be well worth while. Still some faith left! The good students are usually willing to grant that what little of the stuff they get is well worth the trouble—and even wish there might be more of it, especially if it could be managed without additional work on their part.

"But giving to the opinion of these earnest students all the weight it deserves, I am still forced to admit that those who have had one or two years of technical writing are far from being as eager for it as were those who began it three years ago."

The reason for the decrease in popularity of the courses was the recognition by the students that there was no fundamental difference between "technical writing" as taught to mining engineers and "composition" as taught to general students. "They have found that learning to write well on technical subjects is the same old grind that composition always was. And a good many of them are taking engineering just because they didn't like to write compositions in high school!"

While the unwillingness of the average engineering student to write compositions has prevented the courses offered from obtaining great popularity, Mr. Black is able to report that good results are obtained.

"That the students at the College of Mines have improved under instruction, there is no doubt in my mind. I have proved by the exactest tests that can be applied that those finishing the second year course can write very appreciably better than those just entering College, if they try. They do not write examination papers much better—can you expect it when they are nearly always pressed for time? The compositions written by the second year men last April as the final examination for the course were, I believe, the best set of compositions ever written by any class at the College. Moreover, I will match them with similar sets written by sophomores in any college or university."

In Canada the teaching of English to mining students is quite a different problem from that presented in Michigan. Here the mining students receive their education in Universities where every facility for the teaching of English is available. Special instructors are not necessary for mining classes. All that need be done is to arrange between the University Departments for the desired instruction.

The question to be considered here is whether the requirements in English are now strict enough. Students acting on their own initiative can usually find opportunity for as extensive courses in English as they desire. But the average engineering student has an idea that good English, while desirable, is not very essential to his success. Is the student capable of judging? It would be better to assume that he is not, and insist on courses in English being taken.

### COBALT SILVER MINING COMPANIES PLAN NEW WORK

Following on the reopening of the few producing mines shut down on account of the war now comes news of further activity. The Cobalt Lake and La Rose companies have adopted programs which call for vigorous exploration and development of their property.

Some time ago the Cobalt Lake Company prepared plans for the draining of the lake so that the known ore-bodies could be extracted and others searched for. Most of the property underlies the lake and the project involves large expenditure both for draining off the water and providing other companies with water and the town of Cobalt with a sewage system. In spite of the inability of the town to finance its share of the work at this time the company intends to go ahead.

The La Rose mine, one of the earliest discovered and one of the best at Cobalt, has for some time not been showing up well on development. The known ore-bodies have been almost completely extracted and little new ore has recently been found. The company has a very large cash surplus and is in a position to carry on extensive development work if desired. For some time

it has been doubtful whether the mine would soon be closed down or a vigorous plan of exploration adopted. Acting on reports by Manager R. B. Watson and P. A. Robbins the directors have decided on the latter policy. This means that operations will be carried on that may easily lead to the discovery of more ore. Much will be learned that will be of use both to the company and to the owners of the surrounding properties. The structure in the vicinity of the La Rose merits close study. The possibility of discovering ore on the property is a fair one.

### LORRAINE IRON DEPOSITS

The activity of the armies in Lorraine near the borders of France, Belgium, Luxemburg, and Germany draws attention to the fact that this region is a very large producer of iron ore. In all four countries the working of the iron deposits in this neighborhood is and has been for years an important and profitable industry.

The Lorraine iron ore district, easily the greatest in Europe, has a productive area of about 300,000 acres or approximately 470 square miles. Of the total there is in France 180,000 acres, in Germany 106,000 acres, in Luxemburg 9,000 acres, and in Belgium a few hundred acres now practically worked out. The ores, which are oolitic, occur as a group of sedimentary beds of varying thickness.

In the war of 1870 the Lorraine district was the scene of much fighting, as it is in this war. When the war was over France ceded to Germany practically all of the district in which iron ore outcropped. As remarked by Mr. E. C. Eckel in his recently published work on iron ores, "the war of 1870 was in reality an exchange of blood for iron in a way that the world has not appreciated."

After the war ore was developed at greater depth on French territory and the ore reserves in France are now known to be greater than those in Germany.

In the International Geological Congress report on iron ore resources of the world the Lorraine-Luxemburg region is credited with 5,600,000,000 tons. Of this 2,835,000,000 tons is in Germany, 3,000,000,000 tons in France, and 270,000,000 in Luxemburg.

It seems not improbable that the next report on iron ore resources will show those of Germany to have decreased about 2,835,000,000 tons and those of France to have increased a corresponding amount.

### WAR AND OIL

Oil is a very valuable commodity in war as in peace. Considerable importance is therefore attached to probable changes in control of oil fields during the war. Fortunately it seems that Germany is to be the chief sufferer.

In the British Isles the oil shales of Scotland are the source of a very large annual production. This field is in no danger.



Great Britain's sources of supply across the seas are also available owing to the protection afforded by the Allies' fleet. The same is true of France's supply.

On the other hand Germany's sources of supply both by land and sea are being gradually cut off. Germany produces some oil; but depends largely on imports from other countries. The oil fields of Russia and Austria are ordinarily called upon to supply large quantities to Germany. Russia, of course, exports no oil to the enemy, and by the invasion of Galicia is depriving the enemy of the most important source in Austria—the Boryslaw-Tustanowice field.

Ordinarily Germany imported large quantities of oil from overseas. This supply has been completely cut off except for small quantities which reach Germany through neutral ports.

Germany depends largely on oil for her war machines, and it may be taken for granted that she had very large stocks on hand before the Kaiser launched his campaign for the mastership of Europe. However, the celerity with which the Allies have cut off the supply will cause no little embarrassment if the war is prolonged.

## CORRESPONDENCE

### KIRKLAND LAKE ORES.

To the Editor of The Canadian Mining Journal:

Sir,—I have read with interest the article by Mr. John A. Dawson in your issue of September 1st. I have had the opportunity of inspecting a great many samples of ore from the Tough-Oakes Mines, and have followed very carefully the analyses on the samples of car lots of the Tough-Oakes ore sampled at our works. The possibility that such tests are wrong may not be precluded, but a number of tests, all giving the same results, afford a reasonable check. Almost conclusive evidence is afforded by the agreement of reports from other chemists and petrographers. Without going into a description of the methods used I will say that up till the conclusion of our tests six months ago none of the samples of the shipments and none of the specimens examined contained any graphitic carbon. Molybdenum was present in all samples of the ore in greater or less extent and apparently proportional to the dark colored substance which Mr. Dawson calls graphite.

Notwithstanding this evidence I would be very much surprised if graphitic carbon were not found sometime or other; the nature of the veins is such as to lead one to expect this mineral.

The error into which Mr. Dawson has allowed himself to be drawn is quite easily seen, that of generalizing from insufficient data. It is not an uncommon thing for a chemist to take one sample, and from the analysis thereof to evolve his "system."

I take this opportunity of correcting Mr. Dawson for the reason that the presence of the metal molybdenum in the Tough-Oakes ores was first determined in our laboratories; and owing to the fact that all the analyses that have been published by the Tough-Oakes company have come from our own laboratories.

Incidentally I would take exception to the deduction which Mr. Dawson makes in the next to last paragraph of his article. He constructs the mineral sylvanite by

taking all of the available gold, silver and tellurium present in the ore. Inasmuch as all samples examined by myself have contained gold, visible at least under the microscope, it seems that this is an unfair way of determining the presence of sylvanite or any other of the precious tellurides in these ores. It may not be said that there are no precious tellurides present, but after a great many experiments I have concluded that it is probable that hessite is the only one present in economic quantities. If the other minerals do occur they must do so under some microscopic form and in such an event I must confess to be at a loss to know how to settle the question finally.

Two tellurides have been determined definitely, namely, altaite and tetradymite. These two minerals are invariably in intimate association with the native gold, and occur in small veinlets, as individual crystals, or as cavity filling in the nuggets of gold. A remarkable fact with regard to the tellurides found in the cavities of the gold, is that they contain no trace of gold and only a small trace of silver. A similar example is given in the occurrence of a new mineral from Cobalt, presumably of the tetrahedrite group, identified in our laboratory. This has a probable formula of  $\text{Sb}_2\text{S}_3 \cdot 3(\text{Cu}_2\text{S})2\text{FeS}$ ; has a bright metallic lustre resembling specular iron;  $H=1.0$  to  $1.5$ ; and gives a reddish brown streak on paper. Although this mineral is almost invariably found in cavities in the native silver in the Townsite and Nipissing ores, yet the specimens analyzed showed only a trace of silver. The meaning of this physical affinity and chemical antagonism will, no doubt, afford discussion for some one more capable of undertaking it than the writer.

Yours, etc.,

E. G. CAMPBELL.

Cobalt, Sept. 25, 1914.

### OIL FIELDS OF EUROPE.

In the British shale oil fields of south-east Scotland about 3,000,000 tons of shale is raised annually, producing about 72,000,000 gallons of crude oil by destructive distillation in retorts. About 75 per cent. of this oil is converted into finished products, notably fuel oil, which is used very successfully by the British navy.

The oil fields of Germany produce 130,000 to 140,000 tons of crude oil per annum. Apart from this, large quantities of soft coal are distilled in Germany, and from the tar oil various products are obtained, including liquid fuel both for consumption under boilers and for operating Diesel, semi-Diesel, and other internal combustion engines. Germany imports about 1,200,000 tons of petroleum products per annum.

Austria has a large oil industry in the north-east part of Austria, known as Galicia. The Galician fields were producing immediately before the war at the rate of about 1,000,000 tons per annum. The Russians are advancing towards these fields from the eastward.

Roumania produces about 1,800,000 tons of crude oil per annum, much of which is very rich in benzine (gasoline, petrol or motor spirit). The mobilization of the Roumanian army has interfered with production.

Italy produces about 10,000 tons of crude oil per annum, including some of very light quality.

Russia produced last year 9,246,942 tons of crude oil. There are four principal producing districts, known as the Baku, Grosny, Maikop and Ural-Emba.



## THE DAY

By Henry Chappell.

(The author of this poem is a railway porter at Bath, Eng. He is known to his comrades as the "Bath Railway Poet.")

You boasted the Day, and you toasted the Day,  
And now the Day has come.  
Blasphemer, braggart, and coward all,  
Little you reck of the numbing ball,  
The blasting shell, or the "white arm's" fall,  
As they speed poor humans home.

You spied for the Day, you lied for the Day,  
And woke the Day's red spleen.  
Monster! who asked God's aid Divine,  
Then strewed His seas with the ghastly mine;  
Not all the waters of the Rhine  
Can wash thy foul hands clean.

You dreamed for the Day, you schemed for the Day,  
Watch how the Day will go.  
Slayer of age and youth and prime  
(Defenceless slain for never a crime)  
Thou art steeped in blood as a hog in slime,  
False friend and cowardly foe.

You have sown for the Day, you have grown for the Day;  
Yours is the harvest red.  
Can you hear the groans and the awful cries?  
Can you see the heap of slain that lies,  
And, sightless, turned to the flame-split skies  
The glassy eyes of the dead?

You have wronged for the Day, you have longed for the Day  
That lit the awful flame.  
'Tis nothing to you that hill and plain  
Yield sheaves of dead men amid the grain;  
That widows mourn for their loved ones slain,  
And mothers curse thy name.

But after the Day there's a price to pay  
For the sleepers under the sod,  
And He you have mocked for many a day—  
Listen, and hear what He has to say:  
"Vengeance is mine—I will repay."  
What can you say to God?

### SCHUMACHER.

It is stated by Mr. F. W. Schumacher, the owner of the Schumacher mine at Porcupine, that he intends to erect a mill on the property, so encouraged is he by the indications there.

The contractors are the only men who have been allowed to go recently from the property, and they had completed their work. Sinking has been stopped at present, but veins already found above the 300 ft. level will be developed, he states.

Further sinking to the 500 ft. level may be undertaken later.

### JUPITER.

The secretary of the Jupiter Mines, Limited, announces that the McKinley-Darragh option, which was to expire on September 18, was extended for a further term of three months.

Development has been more favorable during the past two or three months than in the early part of the option period, but the McKinley-Darragh company did not feel that the results justified the exercising of their option at this time, and accordingly asked for an ex-

tension, which the Jupiter directors considered that in view of existing circumstances the interest of all considered will be best served by granting.

The extension calls for the continuation of operations in substantially the same manner as they have been heretofore carried by the McKinley-Darragh company. The terms of payment in the event of the exercise of the option remain unchanged. These terms include the payment of the existing bonds immediately upon the exercise of the option. The additional interest accruing on the bonds and the additional sum required to carry on the development are the price being paid by the McKinley-Darragh company for the extension. The McKinley-Darragh company has the right to exercise its option before the expiry of the three months if it so desires.

### CALGARY OIL FIELD.

According to the Natural Gas and Oil Record interest in the Calgary oil field last week centred around the well of the United Oils Co. Aside from the favorable showings found there, the entire field was very quiet. The well has now reached a depth of 2,650 ft. The gas pressure is increasing, and there is every indication that a producing oil well will be brought in. There have been good showings of oil for the last two hundred feet. O. G. Devenish and other officials of the company who have been spending a great deal of time at the well for the last few days expect to bring in a real oil well.

Tubing in the Calgary Petroleum Products No. 1, the Dingman Discovery well, is being raised in the hope of getting better results. It is possible that the drill will be put back in that well and the immediate territory thoroughly tested. Drilling will be resumed at the No. 2 well of the same company within a few days.

The Acme now has a standard outfit on the way to the United property, where they will put down a well on a royalty basis.

Troubles between the Alberta Drilling Co., the contractors and the Dome Oil Co. have continued during the week, with the result that work on the well is closed down.

Word from Wetaskiwin, in the north, is to effect that the No. 2 well, now drilling, has reached a depth of 1,216 ft., and a heavy flow of gas has been encountered. The Ottawa Petroleum has let the contract for drilling a well on section 7, Township 32, Range 5, and the equipment is now all on the grounds. The Alberta Associated well on Section 7, Township 16, Range 2, has now reached a depth of 220 ft., and all equipment is on the ground for another well in the Rock Mountain House district. All casing is back in the hole at the Federal and they are again drilling and making good progress. Piedmont has awarded a contract and fully expects to be drilling within two weeks. Western Pacific has been under-reaming and putting in casing during the week. There is wet gas in this well. Wet gas has also been encountered in the No. 2 well of the Northwestern Pacific.

The Herron-Elder well (Alberta Petroleum Consolidated No. 2) has been straightened and drilling resumed. The gas flows increased at both the Alberta Petroleum No. 1 and the Prudential during the past week, and good progress has been made in drilling.

Taken all in all the Alberta field looks better to-day than ever before, and news of a real producer on the property of the United can be looked for at any moment.



# MILITARISM vs. PATRIOTISM

By F. W. Gray.

Application has been made by some of the men of Sydney, Cape Breton, for permission to form a city regiment. Most people noticing this announcement would regard it as a natural and commendable action for Sydney men to take in this day of supreme effort. But the Sydney Trades and Labor Council have before them a resolution of protest against the formation of this mooted regiment because of the tendency it betrays to foster "the abuse of militarism."

No doubt the men who framed this resolution are excellent citizens and sincere in their convictions, but like many persons whose thinking is confused or superficial they mistake current shibboleths for verity, and they use specious phrases without analyzing their real inwardness. What does the word "militarism" imply? Certainly it is a misnomer in the sense in which it has been used, and apparently is still used, by a certain school of trade unionists if applied to home defence. The so-called Trades and Labor Congress is professedly an international body which has affiliations with the American Federation of Labor and such reactionary bodies as the United Mine Workers of America. The deprecation of home militias, for reasons which have been sufficiently obvious in Cape Breton, in Vancouver and in Colorado, is a plank in the political platform of the Trades and Labor Congress and its affiliations on the other side of the line, and this attitude has unfortunately clouded the thinking of many well-meaning men who, probably, if they thoroughly dissected their mental processes would find themselves to be patriots in the truest sense of that much misused word. All sane men denounce the abuse of militarism, and it is because of the widespread hatred of militarism among the British nation that the Empire is now engaged in what all thinking Britons reverently believe to be a righteous war against the desolating idea which finds its grimmest exemplification in the Prussian military system. We commend to the careful consideration of all trade unionists in Canada the following extracts from a resolution adopted by the Parliamentary Committee of the Trade Union Congress of Great Britain, after a two-days' conference. It proceeds:—

"The Parliamentary Committee are convinced that one important factor in the present European struggle has to be borne in mind so far as our own country is concerned—namely, that in the event of the voluntary system of military service failing the country in its time of need, the demand for a national system of compulsory military service will not only be made with redoubled vigor, but may prove to be so persistent and strong as to become irresistible. The prospect of having to face conscription, with its permanent and heavy burden upon the financial resources of the country, and its equally burdensome effect upon nearly the whole of its industries, should in itself stimulate the manhood of the nation to come forward in its defence, and thereby demonstrate to the world that a free people can rise to the supreme heights of a great sacrifice without the whip of conscription.

"Another factor to be remembered in this crisis of our nation's history, and most important of all so far as trade unionists and labor in general are concerned, is the fact that upon the result of this struggle in which this country is now engaged rests the preserva-

tion and maintenance of free and unfettered democratic government, which in its international relationships has in the past been recognized and must unquestionably in the future prove to be the best guarantee for the preservation of the peace of the world.

"The mere contemplation of the overbearing and brutal methods to which people have to submit under a government controlled by a military autocracy—living, as it were, continuously under the threat and shadow of war—should be sufficient to arouse the enthusiasm of the nation in resisting any attempt to impose similar conditions upon countries at present free from military despotism."

This is the studied opinion of the highest deliberative body of the representatives of labor in the very home of trade unionism—members of the Mother of Parliaments—and it may be conceded that Britons understand and practise the truest and completest democracy yet evolved.

A recent editorial of the Chicago Tribune, after reviewing the wonderful unanimity of the Empire in this struggle naively concludes that the British Empire "is a queer institution" and concludes by saying "in reality there is nothing queer about it. The undoubted truth of the matter is that the words 'British Empire' stand for the greatest republic the world has ever seen."

In Mr. Asquith's eloquent and burning speech recently delivered in the House of Commons he likened Belgium to Sparta and Athens and reminded the world of the marvellous defence of the Dutch Republics against the military autocracy of Charles V. of Spain. Mr. Asquith rightly upheld the British Empire as the age-long champion of the small nationality. Indeed, what does the British Empire consist of but a group of small independent nationalities, bound together by a common origin and common aims, and destined to a still closer union and a more glorious future than even its storied past?

But suppose the Empire, crushed by the heel of the Prussian Junker, and our quiet homes given to the flames as Louvain was, our wives and daughters subjected to nameless outrage as the women of Louvain were, our religious edifices and teachers treated as they were treated in Louvain, would Canadian trade unionists consider that Canadian troops were exponents of the "abuse of militarism"?

No, we will not do Canadian trade unionists the injustice of thinking that they will play any other part in this "crowded hour" of our Empire's life than the part of men who fight for the country of their fathers and the temples of their God. They will be found saying with Bret Harte:—

Hark! I hear the tramp of thousands  
And of armed men the hum;  
Lo! a nation's hosts have gathered  
Round the quick alarming drum,—  
Saying, "Come,  
Freemen, come!

Ere your heritage be wasted," said the quick  
alarming drum.

\* \* \* \* \*

And the great heart of the nation, throbbing,  
answered, "Lord, we come!"



### MANY MEN ARE NEEDED.

Lord Kitchener, speaking in the House of Lords on August 25, as Secretary of State for War, said:

"While other countries engaged in this war have, under a system of compulsory service, brought their full resources of men into the field, we, under our national system, have not done so, and can therefore still point to a vast reserve drawn from the resources both of the Mother Country and of the British Dominion across the Seas. The response which has already been made by the great Dominions abundantly proves that we did not look in vain to these sources of military strength, and while India, Canada, Australia and New Zealand are all sending us powerful contingents, in this country the Territorials are replying with loyalty to the stern call of duty, which has come home to them with such exceptional force. Over seventy battalions have, with fine patriotism, already volunteered for service abroad, and when trained and organized in the larger formations will be able to take their places in the line. The 100,000 recruits for which, in the first place, it has been thought necessary to call have been already practically secured. This force will be trained and organized in divisions similar to those which are now serving on the Continent. Behind these we have our Reserves. The Special Reserve and the National Reserve have each their own part to play in the organization of our national defence.

"The Empires with whom we are at war have called to the Colors almost their entire male population. The principle we on our part shall observe is this: that while their maximum force undergoes a constant diminution, the reinforcement we prepare shall steadily and increasingly flow out, until we have an army in the field which, in numbers not less than in quality, will not be unworthy of the power and responsibilities of the British Empire. I cannot at this stage say what will be the limits of the forces required, or what measures may eventually become necessary to supply and maintain them. The scale of the Field Army which we are now calling into being is large, and may rise in the course of the next six or seven months to a total of 30 divisions continually maintained in the field. But if the war should be protracted, and if its fortunes should be varied or adverse, exertions and sacrifices beyond any which have been demanded will be required from the whole nation and Empire, and where they are required we are sure they will not be denied to the extreme needs of the State by Parliament or the people."

The Prime Minister in the House of Commons on August 27, in answer to a question, said:

"Most excellent service has been rendered by members of this House and by local political organizations in the work of giving information and arousing public attention to the necessity of raising recruits. I trust there will be no slackening of these patriotic efforts, but that they may be carried on upon an even more extended scale in future. My noble friend Lord Kitchener needs all the recruits he can obtain."

### DOMINION STEEL.

The directors of the Dominion Steel Corporation have voted to defer action on the preferred dividend due Oct. 1. It was explained that any other course was out of the question, owing to the disturbed business conditions all over the world. The dividend is cumulative and will be paid as soon as business shows some indication of recovery.

### COPPER.

Fairly large sales of electrolytic copper have been made to consumers at 12 cents, 30 days.

The last mail advices from Germany said that spot copper was bringing in the neighborhood of 16 cents per lb. as against the New York price of 12½ cents, showing how scarce the metal is over there.

### THE GOLD POOL.

In perfecting plans for the \$100,000,000 gold pool it has been decided that the Clearing Houses in various localities from which participation is expected shall have charge of the subscriptions in those localities. These Clearing House Associations will invite the co-operation of State banks and trust companies in their cities, these cities being central reserve and the reserve cities. The special committee of New York Clearing House is now preparing a letter which will be sent to the State banks and trust companies inviting their co-operation in same manner as in city note syndicate.

It is thus expected that participation in the pool will be the widest and greater than in any co-operative money movement in the history of American finance.

The Clearing Houses of the reserve and central reserve cities will co-operate with the special committee of the New York Clearing House and with the Forgan committee in plans for use of the money.

### STEEL ORDERS RENEWED.

Pittsburg, Sept. 22.

One of the largest orders for export steel which has come to this country since the commencement of the European war has been secured from the Government of Queensland, Australia, by the Carnegie Steel Co.

The order is for 17,000 tons of steel rails, which will be manufactured by the Homestead plant. Arrangements have already been made for the delivery of the rails. The European war is directly responsible for the big Australian order coming to this country.

Several weeks ago Col. August Evans, a representative of the Queensland Government, came here, and after inspecting several of the local steel mills, placed a tentative order for the rails, and after several days had elapsed, however, the order was cancelled with the announcement that the rails were to be made in Europe.

During the latter part of last week James Grant, secretary to Col. Evans, arrived in this city and immediately opened negotiations with the Carnegie Company for the manufacture of the rails, the delivery of which was to be in accordance with arrangements temporarily with the European makers.

The above order should not be confused with the one for which the officials of the Dominion Steel Corporation are understood to be negotiating. It is a South African order, which it is hoped to secure for the Sydney plant.

It is understood the initial orders received from the British market as the result of the visit of an official there consists of 2,000 tons of nails and 2,000 tons of rods.

Just how the British market will develop for Canadian trade of that character remains a matter of conjecture.

A good deal of the trade which Canada might eventually get which formerly was supplied by Germany is, of course, cancelled by war conditions and this country will have to wait for the return of normal conditions before expecting large or profitable results.



# GOLD MINING AT PORCUPINE AND KIRKLAND LAKE, ONTARIO

By Ben Hughes.

After six weeks' warfare it can be stated without fear of contradiction that the gold industry of the Province of Ontario has received a stimulus from the conditions that prevail. This relates, of course, solely to the mines that are in a position to ship bullion now, and though the mines do not actually receive more for the output, the smelters are making conditions of shipment and settlement and treatment much easier.

Those companies which are not yet producing, but have enough money on hand to proceed without borrowing, are continuing operations as before. The war has, however, shut down one or two prospects where development was being paid for by borrowing money. This has not been of material importance to the Porcupine camp, since there were very few gold prospects operating on money raised by stock subscription before the war started. In fact, two only have been affected: Foley O'Brien, where no effort has been made

Mill.	Daily Tonnage Treated.
Dome. . . . .	750
Hollinger. . . . .	750
Porcupine Crown . . . . .	125
McIntyre. . . . .	300
Porcupine Vipond . . . . .	80
Rea. . . . .	40
Little Pet . . . . .	15

2,050

Within the next two months this tonnage will be added to considerably. The mill at the Dome Lake is being overhauled and will probably be able to treat from 80 to 100 tons a day before the end of October and the mill at the Vipond will soon handle 100 instead of 80 tons per day.

**Hollinger.**—The progress of the year has served to accentuate the prominence of the Hollinger's position



Constructing Foundations for Addition to McIntyre Plant

to rebuild since the plant was burnt down, and the Schumacher. Some men have been laid off at the Schumacher; but the owner has announced that a mill will shortly be constructed.

The war, however, has had a most grave and undesirable result in hindering the taking up and development of promising surface showings, of which there are many, from Swastika and Kirkland Lake to Hurricanaw. Under normal conditions there would have been quite a number of small outfits proving up properties under option at Kirkland Lake, Sesikinika and Porcupine. There can be no hope of better conditions for the prospector until the strain imposed by the war has been eased.

The Porcupine camp steadily gains in importance day by day. More than 2,000 tons of ore is treated daily in the various mills. The tonnage treated in the mills to-day is approximately as follows:

in the camp. The yield from the big mine is limited by its power capacity. So far the demands of the mill have pushed the capacity of the power plant to the limit; but when the new compressor plant is running there should be no further difficulty in keeping ahead of the requirements and at the same time allow to the Acme the development that it certainly deserves. To-day so restricted is the power at the command of the Hollinger that outlying shafts have been shut down until the first big compressor is turned over and running. The situation has been rendered more acute since the Vipond resumed work, that company leasing their power to the big mine until operations were resumed.

It is expected that the first big compressor will be available early in October; the Fraser & Chalmers compressor has been shipped and is now in the high seas. The foundations are in and the building completed. A



second machine will be running shortly after the first.

At the Hollinger the sinking of a six compartment working shaft has been commenced. It will be pushed through to the 1,300 ft. level, levels being cut at the 425 and 800 ft. This working shaft will serve the Hollinger, the Acme and the Miller-Middleton. It is being sunk on Acme property.

To-day there are no less than 900 men on the Hollinger pay roll. Many of these are occupied in construction. It is, however, probable that the enlarged scheme of operations will necessitate a permanent force of 1,100 or 1,200 men.

**Dome.**—At the Dome Mr. Keading is effecting economies and raising the tonnage. There has been a considerable reduction in staff and the total force now number about 370 men. Economies are being worked out both in the mill and underground. For instance, by installing an ore bin at the crusher station and separating the fines from the coarser rock there, it is anticipated that in crushing and conveying the costs can be reduced from five to three cents a ton. Underground larger ore cars are used, and the shoots along

the shoot blocked out above the 200 ft. level by the old company. There are two drills on development work.

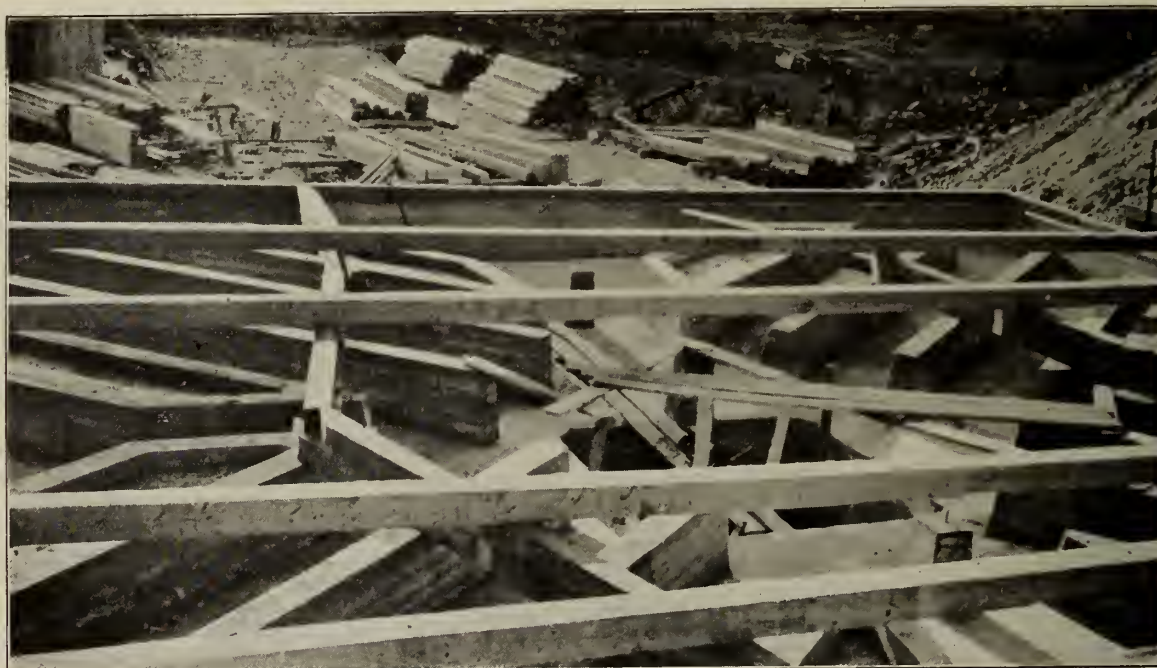
**Teck-Hughes.**—The Nipissing having a large cash surplus available, the option on the Teck-Hughes has not been affected by the war. Development so far has been quite successful. On the surface a vein has been discovered running parallel to the main lead. It is a promising one.

**Tough-Oakes.**—The Tough-Oakes is producing and shipping gold with the greatest expedition. All ore broken goes to the rock-house, where it is hand picked. All the high grade is shipped and the rest sent to the stock piles until a larger mill has been provided for its treatment. About 12 tons a day is being treated in the little mill. Construction of the large mill is being proceeded with.

#### PORCUPINE VIPOND MINES.

Under date of September 24, 1914, Henry H. Ward, president, sends the following letter to the shareholders of Porcupine Vipond Mines, Limited:

Since May 2, 1914, your manager, Mr. C. H. Poirier, has been so continuously engaged with the various de-



Foundation for Porcupine Vipond Cyanide Plant

the 1,200 ft. drifts widened, so that economy of time in filling the cars will be effected.

**McIntyre.**—The McIntyre is being examined for the Nipissing Mines Co. by Mr. Morton Webber, who has spent the last two years very largely in work of this character. If the option is taken up it will doubtless lead to further activity among the mines bordering on Pearl Lake. The Plenaurnum has a section of the lake from which McIntyre territory could be worked to great advantage, and several of the principal shareholders hold large blocks of stocks in both companies.

**Porcupine Pet.**—Two small properties are shipping a little bullion. The Porcupine Pet has discovered a shoot of remarkably rich ore on the 50 ft. level, and the little Nissen stamp mill is running continuously.

**Rea.**—At the Rea the leasing company is making very good clean-ups from the treatment of ore from

tails of the mill construction, purchase and installation of machinery, and preparation for working the mine, that I deemed it unwise to call upon him for any extended report, and have contented myself with making this general report from current data and information.

Pursuant to the arrangements made as outlined in my letter of May 2, 1914, for the underwriting of 300,000 shares of treasury stock of your company, work was immediately begun on a cyanide extension to the plant. The extension was designed by Mr. C. H. Poirier, manager of the property, advised by Mr. John B. Dorr, of the Dorr Cyanide Machinery Co.

The new building is a structure 60x130 ft., and is added directly to the original mill without material alteration of the latter. There are installed in the new building among other items the following:



Five 26x10 ft. wood tanks with Dorr standard thickeners; three 12x12 ft. wood tanks with Dorr standard agitators; two 20-frame Merrill precipitation presses, pumps, motors and accessory apparatus.

The ore is treated by crushing in cyanide solution, and thereafter by continuous decantation.

Mr. Poirier, in 1912, first recognized the adaptability of the continuous decantation process to Porcupine ores as permitting, with no sacrifice in regard to recovery, a considerable saving in the cost of construction and installation over the sliming and filter-pressing method then exclusively used in the district. Plans were drawn, but owing to conditions with which shareholders are acquainted, it was impossible to follow them out until recently. During this time, however, a company operating in the district has installed a continuous decantation plant which followed in a general line the flow sheet outlined by Mr. Poirier and which has proved to be extremely efficient in all respects.

Clearing of the ground, laying of foundations and construction of the mill building began in May, and the extension was completed about September 1st, on which date, after a preliminary test, the mill was put in operation, running about one-half capacity. On September

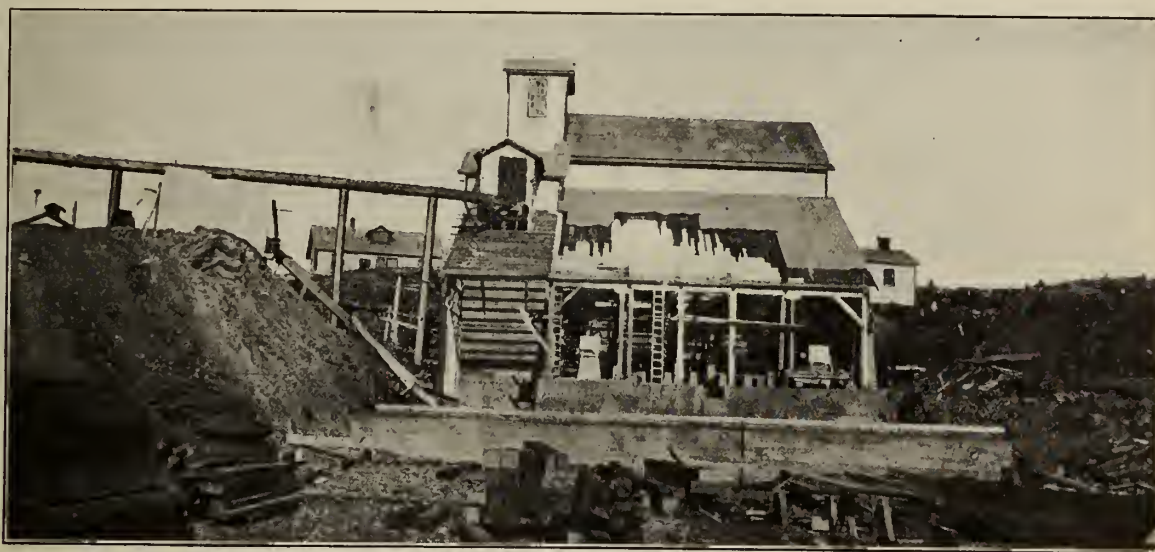
in part, and because subsequent payments were not made at all. However, the financial plan had provided a considerable margin, and in view of this, and through the company availing itself of other resources put at its disposal, including financial guarantee made by me personally, the extension of the plant was successfully completed, mining resumed, and the property put on an operating basis in spite of adverse financial conditions and the general disturbance of business due to the war in Europe. The company has had the advantage of a liberal attitude on the part of various corporations, firms and individuals with whom it has done business or employed by it.

We are fortunate in having been able to have delivered or to secure on contract a sufficient supply of cyanide, zinc dust and other necessary materials, principally imported from abroad, to insure the uninterrupted operation of the mill.

The plant is well covered by insurance.

A financial statement and general report will be made as soon as payments on various contracts are completed and matters are in such shape that they can be put before shareholders in a clear manner.

Mr. Poirier continues as manager of the property. The firm of Poillon & Poirier, mining engineers, composed of



**Making Addition to Porcupine Vipond Mill**

5th, the tanks were completely bedded and the first tailings passed out of the mill. The plant is operating satisfactorily in every respect, and will be brought up to full capacity during the present month. It is now on a basis of profitable operation. Exact figures cannot be given until normal conditions of full load are established.

While carrying on this program of mill construction and completing it absolutely according to the schedule laid out, Mr. Poirier made preparation for resuming working of the mine itself. Three raises were started for better ventilation and for more economical handling of ore. One of these has already been put through to the surface. A program for extension of development has been begun for the purpose of maintaining and, if practicable, increasing, the proved ore reserves.

Shareholders should be advised that the underwriting program outlined in my letter of May 2, was abandoned by reason of the July payment having been made only

Messrs. H. A. Poillon and C. H. Poirier, have been retained as consulting engineers and have been of great service in that capacity.

Mr. H. W. Heine has served the company well as superintendent. He has frequently been in sole charge during Mr. Poirier's necessary absences.

Mr. Poirier has shown the greatest devotion to the company's interests, and this devotion with his high ability, combined in four months' time to bring to completion, at a reasonable cost, a large addition to the plant, which should prove economical and highly efficient in operation. This he has done in spite of many difficulties. He has spared himself in no way, and has always willingly undertaken to help the completion of this operation in any manner whatsoever, whether strictly within the requirements of his duties as manager or not.



## MINE RESCUE TRAINING IN BRITISH COLUMBIA

By E. Jacobs.

In August Mr. Thomas Graham, Chief Inspector of Mines, presented to eighteen men employed at the Jingle Pot coal mine, near Nanaimo, Vancouver Island, Provincial Government certificates of efficiency in mine-rescue work. The recipients of the certificates took their mine-rescue course at the Government training station at Nanaimo. There are now 161 men who have similarly qualified and obtained Government certificates, beside a considerable number who have successfully passed examination after training in one or other of the mine owners' rescue stations.

Late in 1912 Mr. W. J. Dick, of Ottawa, mining engineer to the Commission of Conservation, Canada, presented to the secretary of the commission a report on "Mine-Rescue Work in Canada," which report was afterward printed by the commission and widely distributed. At that time, as mentioned by Mr. Dick, British Columbia was the only one of the coal producing provinces of the Dominion requiring rescue apparatus to be kept at coal mines. The following is an excerpt from the detailed information given in Mr. Dick's notice of British Columbia in that report:

"The Coal Mines Regulation Act, 1911, makes provision for mine-rescue apparatus, as follows:

"There shall be established by the owner, agent or manager of every colliery such number of oxygen helmets or some form of mine-rescue apparatus as may be approved by the Minister of Mines.

"Such mine-rescue apparatus shall be constantly maintained in an efficient and workable condition, and shall in all cases be so stored or placed in or about the mine as to always be available for immediate use.

"The Lieutenant-Governor in Council may from time to time establish mine-rescue stations for the purpose of supplementing, in case of need, the colliery installations of mine-rescue apparatus, and also for the purpose of training holders of certificates of competency under this Act in the use of such mine-rescue apparatus as may be approved by the Minister of Mines; and it shall be incumbent on the owner, agent or manager of every operating mine to have all certificated officials who are physically fit, and not less than three per cent. of such number as the Chief Inspector of Mines may deem sufficient of the workmen, trained in the use of such established mine-rescue apparatus.

"Provided that in cases of emergency such stations shall be available for the use of any trained corps of mine-rescuers, duly qualified medical practitioners, or corps trained in the work of first aid to the injured, subject, always, to the order of an Inspector of Mines."

"Although this Act has only been in force a little more than a year, the mine operators, as well as the Government, are doing all in their power to lessen the number of fatalities incident to mine explosions and mine fires in so far as this can be accomplished by trained men equipped with suitable breathing apparatus."

Mr. Dick further gives particulars of the training work necessary to obtain a certificate of competency at several of the collieries; also the forms for "Physician's Examination," and the "Mine-Rescue Training Record."

In the report for 1912 of the Chief Inspector of Mines, included in the "Annual Report of the Minister of Mines" (pp. 204-8), it is stated that much pro-

gress was made in mine-rescue work in 1912; mention was made of the Canadian Collieries (Dunsmuir) Ltd., having built commodious and well arranged stations at its Extension and Cumberland collieries, respectively; that the Provincial Government had built, and on November 1 opened, a station and had appointed an instructor; also that a site had been purchased at Nanaimo and erection of a station was in progress. Mr. Graham added:

"Much progress in training has been made by several of the local companies, some of whom issue diplomas to their employees who take a course of training.

"On May 10th last, the writer, on the invitation of the Western Fuel Co., had the honor and pleasure of presenting forty-one employees of that company with certificates of competency in mine-rescue work. This company has issued sixty-three certificates of competency since the opening of its station.

"In November last Inspector Strachan had the honor and pleasure of presenting fourteen employees of the Nicola Valley Coal and Coke Co. with certificates of competency earned at that company's station."

Concerning mine-rescue work in 1913, the Chief Inspector reported (see "Annual Report of the Minister of Mines, 1913"):

"The Government now has two fully equipped mine-rescue stations in the Province; these stations are equipped with mouth-breathing type of the Draeger apparatus. The equipment consists of sixteen two-hour apparatus, eight half-hour apparatus and four pulmotors. During the year twelve C. E. A. G. electric safety lamps were added to the equipment.

"Training was actively conducted most of the year at the Fernie (Crowsnest pass) station, with George O'Brien as instructor, and Government certificates of competency were issued to seventy-three persons from this station.

"The Nanaimo station was not taken over until late in the year and little work was done at it, but pending its completion, the instructor, J. D. Stewart, was sent to Merritt, and, through the courtesy of the Nicola Valley Coal and Coke Co., which granted the use of its station, Mr. Stewart, assisted by Frank Bond and Inspector of Mines Robert Strachan, instructed a class of twenty-nine men, each of whom was granted a certificate of competency. There were, therefore, 102 Government certificates of competency in mine-rescue work issued during the year. The equipment maintained by the operating companies was supplemented during the year by two-hour Draeger apparatus. For the use of 5,500 underground employees there are in the Province sixty-six sets of two-hour and twenty-six sets of half-hour apparatus, or one for every sixty persons."

It is of interest to note that the Chief Inspector of Mines and several of the mine inspectors under him are fully qualified for mine-rescue work, some of them having taken their training course at the United States training station at Seattle, Washington, prior to the establishment of stations in British Columbia; also that a number of mine officials and other holders of first class certificates of competency under the Coal Mines Regulation Act, are similarly qualified for mine-rescue work.



**BRITISH COLUMBIA COPPER CO.**

Boston.

British Columbia Copper Co. has closed down its smelter and ceased mining operations. Exploratory work continues, however, on part schedule.

The mine management advises that 10,000,000 tons of ore have been put into sight on Copper mountain. This ore averages about 1.85 per cent. copper and carries 72 cents per ton in gold and silver.

Actual construction work on the proposed new mill has not started. Its size has not been definitely determined, but with the blocking out of all the ore now in sight the initial capacity is expected to be at least 1,000 tons daily. Construction will be delayed.

**KEEPING COPPER FROM THE ENEMY.**

In answer to the statement in several newspapers that the Amalgamated Copper Co. had shipped to London its stocks of copper which were held in Rotterdam at the opening of the war, to put them out of reach of the Germans, T. Wolfson, vice-president of the United Metals Selling Co., says:

"The stocks of copper carried by this company in warehouse at Rotterdam at the beginning of the war were stored in a public warehouse, and were covered by warrants in the name of C. S. Henry & Co., a British corporation, which were in the possession of Henry & Co. The British Government formally notified Henry & Co. not to deliver the warrants, and upon instruction of the United Metals Selling Co. that they be delivered into neutral hands, the position of the British Government regarding them was disclosed.

"The warehouse in Rotterdam refused delivery of the copper except on presentation of the warrants and the British Government took possession of the warrants, paid for the copper represented by them and at its own cost and risk removed the copper from Rotterdam to London. The British Government put it absolutely out of the power of the United Metals Selling Co. to make any other disposition of the copper."

**OPENING OF THE PANAMA CANAL.**

It is an extraordinary commentary on the universal upheaval caused by the European war that the opening of the Panama canal on August 15 passed almost unnoticed. What should have been a brilliant ceremony, at which the warships of every European naval power would have assisted, was shorn of most of its display; no European nation participated, and the actual opening was carried out by the passage of the United States naval steamer Ancon, followed by a small squadron of American merchant vessels. On board the Ancon were Colonel Goethals, the celebrated United States engineer, who is Governor of the Canal, a staff of naval and military officers, and the President of Panama. The actual commercial effect of the opening is likely to be not a little obscured by the war.

**COBALT FROM BELGIAN CONGO.**

The great source of the German cobalt is from crude copper produced by the Union Miniere du Haut Katanga, in Belgian Congo, Africa, of which 8,064 tons was produced and shipped to Germany for refining during 1913. The crude copper obtained 2.8 to 3.25 per cent. of cobalt (some ran much higher in 1912), and if 3 per cent. were the average content of cobalt the total was about 242 tons of metallic cobalt. This makes a by-product comparatively easily saved in electrolytic refining.

**COBALT SHIPMENTS.**

Cobalt, Sept. 19.

Upon notice received from the British Admiralty normal insurance rates have been resumed on silver bullion and it is again being shipped. But as Nipissing is still shipping to New York only, a small proportion of the 108,000 oz. crossed the seas. Ore shipments continue normal.

This week the Right of Way shipped two cars from the old mine. One of these was part ore, part concentrates, the other was entirely of concentrates.

The ore shipments from the Cobalt camp for the week ending Sept. 18, were:

	High.	Low.	Total Lb.
Right of Way ....	123,130		123,130
City of Cobalt ....	87,750		87,750
Dom. Red'n .....		85,400	85,400
Cobalt Townsite ..	86,310		86,310
McKin.-Darragh ..	83,620		83,620
La Rose .....	84,140		84,140
	464,950	85,400	550,350

The bullion shipments for the week ending Sept. 18th, were:

	Bars.	Fine Oz.	Value.
Nipissing.....	87	100,445.66	\$54,366.21
O'Brien.....	34	33,770.50	16,770.00
City of Cobalt...	6	4,603.00	2,532.00
Crown Reserve..	53	60,000.00	32,500.00
Townsite.....	6	4,983.00	2,740.00
	186	203,802.66	108,908.21

Cobalt, Sept. 26.

Over half a million oz. of silver bullion was shipped from the camp this week, the price ranging from 51½c. to 53c. an oz. By far the greater proportion of this bullion was destined for the English market. The Caribou Cobalt shipped through the Dominion Reduction Co., where its ore is being treated, to London. La Rose shipped through the Nipissing.

Eight mines shipped a normal tonnage of ore. The Right of Way despatched yet another car, and this property is making its final clean-up. The New Liskeard mine, the Casey, has resumed shipments, and the other English companies, the Cobalt Townsite and the Cobalt Lake, were also on the list. The Seneca-Superior was the only company to contribute more than one car of ore.

The ore shipments from the Cobalt camp for the week ending September 25, were:

	High.	Low.	Total Lb.
McKinley-Darragh .....	172,140	.....	173,140
Seneca Superior .....	62,060	.....	62,060
Dom. Reduction .....	.....	86,710	86,710
La Rose .....	80,740	.....	80,740
Cobalt Lake .....	64,150	.....	64,150
Right of Way .....	34,210	.....	34,210
Cobalt Townsite .....	83,910	.....	83,910
Casey Cobalt .....	65,096	.....	65,096
	563,306	86,710	650,016

The bullion shipments for week ending September 25 were as follows:

Nipissing.....	386	444,537.86	\$234,099.39
La Rose .....	48	55,867.72	29,068.05
Caribou Cobalt ....	37	44,803.80	23,745.59
	471	545,208.58	\$295,913.03



## ELECTRICITY IN COAL MINES

By John Liston, General Electric Co.

The use of electricity in coal mining is not new, as it has been employed to a limited extent for many years. The rapid extension which has recently characterized its application is due to several causes, the more important of which can be briefly outlined as follows:

First, the improved efficiencies of modern electrical machinery in general, and the increasing use of alternating current with its greater flexibility in transmission over distances which are beyond the economical limit of direct current distribution.

Second, the specialization of the electrical manufacturing companies' engineers on the power requirements peculiar to coal mine operation.

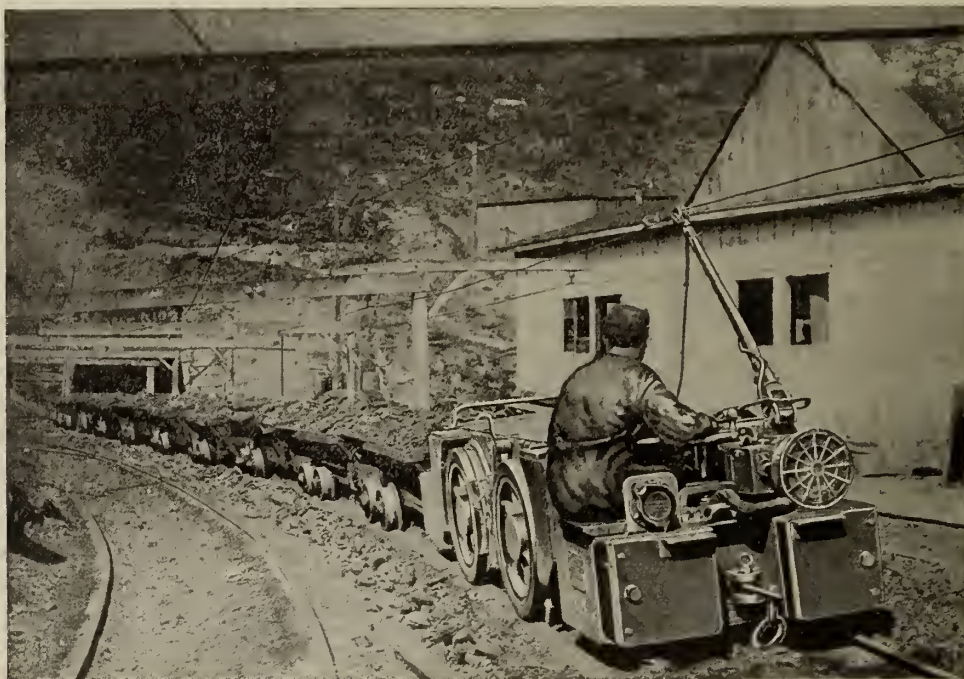
Third, the growing appreciation by the engineers of the mining companies of the advantages of electrical power and their active co-operation in the solution of the problems entailed by special conditions.

Fourth, the notable operating economies which have resulted in numerous installations utilizing electric power, even under the severest service conditions, and the attainment in practically every case of an increased output for a given power consumption.

In some cases, however, the engineers of the mining companies are not fully aware of the inherent economy of electric service and its practically universal applicability, and are, therefore, disinclined to supersede older equipment which, while not so economical in operation, has still proven its practical utility.

### Mine Locomotives.

The superiority of the electric locomotive for mine haulage is largely due to the fact that in addition to its high efficiency, mechanical strength, dependability and simplicity of control, it is the most compact form of tractor available. This last characteristic is of the utmost importance in underground operations where the available headroom is usually limited and where the cost of increasing the height along a roadway—either by brushing the roof or taking up the bottom, would materially increase the cost of mining. Except in special cases it is obvious that steam locomotives cannot safely be used in the mines, and the compressed air type also has many limiting features. It can develop an average efficiency of only about 25 to 30 per cent.—is more cumbersome than the electric type, for a given capacity, and



Fifth, the necessity for the development of coal fields in which the geological conditions were such that the mines could not be economically operated by the older methods, and the continually increasing distances between the working faces and delivery points in mines already in operation which tended to render electric haulage practically imperative.

That the above causes are all given the practical consideration which their effect on operating costs so fully merits, is clearly demonstrated by the fact that in all recent coal mining developments of appreciable size electricity has been adopted as a source of applied power either wholly or in part.

In many of the older workings it has been found that true economy would sanction the scrapping of a large percentage of the steam power equipment and its replacement by a centrally located generating station.

the necessary frequent re-charging of the storage tanks involves delays which diminish its serviceability. The distance which it can travel on one charge is limited.

In the development of the electric mine locomotive there has been a constant improvement in the structural details, as the arduous service conditions which are normally encountered in coal mine operation have become more fully understood by the designing engineers. Due to the compact and heavy structure necessitated by the tractive requirements and limited head room in which it must ordinarily be operated, the electric mine locomotive has from the first been unusually strong mechanically, and the earliest locomotive of this type built by the General Electric Co. is still in daily use after a constant service of 22 years. Three general forms are now commonly used, i.e., the straight haulage, the cable reel or gathering, and the combination or



crab type. The standard weights range from 3 to 25 tons and for low vein mines the total height of the smaller sizes does not exceed 27 inches. The economy obtained in the use of the straight haulage type for delivering trips to the shaft, slope, entry tippie or breaker in mines having reasonably long haulage is generally acknowledged, and units of this type are used in practically all mines where electric service is available.

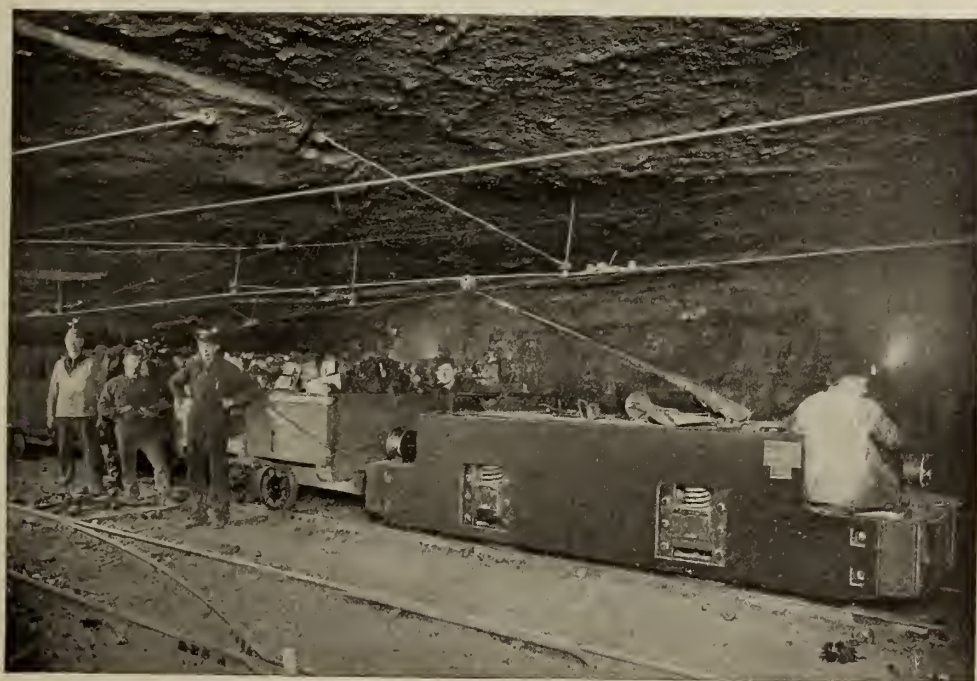
For the main haulage in mines the mule or horse has been almost universally discarded where electric service could be obtained, inasmuch as a single locomotive can effectively displace a considerable number of animals, can travel faster, requires less head room, and can operate 24 hours a day if required. For gathering, however, animals are still used to some extent, as the question of their replacement in this service by gathering locomotives is governed by such a diversity of operating conditions that each installation must in effect be considered as a separate problem.

In some of the larger mines the question of comparative operating costs for each group of workings has been ignored, and cable reel locomotives used throughout for gathering, simply on account of their greater capacity, reliability and general convenience, and the resulting increased output has in every case fully justified the ex-

capacity to permit of its being installed for any length of time without overheating.

After the cable is attached to the trolley wire and locomotive moves forward, the unwinding of the cable causes the motor to act as a series generator, and the counter-torque thus developed produces sufficient tension on the cable to cause it to pay out evenly and drop along the roadbed without producing kinks. This counter-torque produces enough braking effect to instantly stop the reel when the forward movement of the locomotive ceases, and as soon as the locomotive starts back the motor action comes into play and the reel is rewound at a tension sufficient to obviate any possibility of the locomotive overrunning the cable. As the operation of the reel is entirely automatic, the motorman is free to devote his entire attention to the handling of the locomotive.

For haulage in gangways in which the grading for the roadbed is such as to prohibit the use of cable reel locomotives, the combination or crab type, equipped with a hoisting drum and steel cable in addition to the cable reel, is generally used, as it can be blocked in the entries of successive gangways and by means of the hoist can draw the loaded cars up the slopes and then deliver the trips to the main haulage tracks. On short slopes it does the work as rapidly and effectively as a permanent



penditure involved in the complete abolition of animal haulage.

The type of gathering locomotive developed by the General Electric Co. consists of a reel of large diameter driven through double reduction gearing by a small vertical series wound motor, the reel being supported by the motor frame and rotating on ball bearings. Friction is further reduced by also providing the armature shaft with ball bearings. This motor is connected directly across the line and is equipped with a permanent series resistance which protects it from a heavy rush of current when the locomotive is standing still.

A combined switch and fuse is also inserted in the circuit for protection against short circuits and for convenience in opening the circuit if desired, but is not involved in any way with the ordinary operation of the reel. The motor is so designed that it is of sufficient

rope haul or hoist, with the added advantage of portability, and, as it can also perform the duties of both the straight haulage and cable reel types, it is often considered indispensable in mines where a limited number of locomotives can handle the entire output. Its "general utility" features have caused its adoption for all underground work in some of the largest mines in the anthracite fields where the irregular grades in numerous gangways render it especially valuable.

In collieries and mines where the breaker or tippie is located at a considerable distance from the entries or shafts, separate locomotives can be advantageously used for surface haulage, and as they are practically unrestricted in the matter of size, excepting in regard to the capacity of the breaker or tippie for handling the coal received, heavy locomotives—ranging from 10 to 25 tons, capable of delivering a large number of cars per



trip—are commonly used. The retention of steam locomotives for this work involves interruptions due to the necessary coaling and renewal of the boiler water, and renders impossible that continuity of service which is essential in order to obtain the most economical operation of the coal handling plant.

The standard modern mine locomotive motor equipment consists of two direct current units connected to the driving axles through a single reduction gear, although three motors are sometimes used with three pairs of driving wheels, in which case the centre pair are flangeless in order to permit the turning of curves of short radius. There are also a limited number of single motor locomotives still in use, although they are being very generally superseded by the two-motor type.

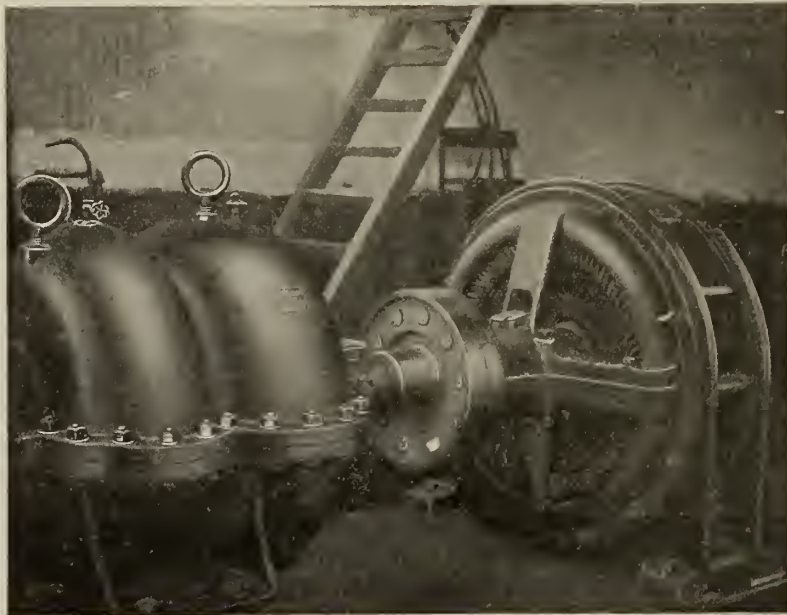
#### Mine Hoists.

For haulage in slope mines or in drift or shaft mines where the different levels are connected by slopes of considerable length, the locomotive cannot be used and recourse is had to various forms of rope haulage with permanent hoisting drums located either on the surface or in chambers underground. In particular instances

The power losses represented by the drop in voltage in the electric conductors is practically negligible for the distances usually in coal mine transmission when compared with the condensation losses in steam piping or the pressure losses in air lines over the same distances.

With steam hoists the exhaust steam practically prohibits any extended use underground, while the exhaust from the air operated type introduces a factor that may have an adverse effect on the mine ventilating system.

The motor driven hoist is the simplest and most compact form, inasmuch as the motor can usually be mounted on a common base with the hoisting drum and arranged to drive it directly through gears, thereby forming an entirely self-contained unit and effecting an economy in weight and in the amount of space required for its installation, which is often of appreciable importance when the hoists are located in the mine. Owing to the superior speed control of the electric type it has greater flexibility in operation and its extreme simplicity not only minimizes the cost of repairs, but obviates the



Electrically Operated Pump

the use of endless chain haul or conveyor belts or buckets may be advisable. Among the advantages claimed for electric hoists are:

The power is uniformly applied throughout the operating cycle as there is no reciprocating motion or intervening connecting rods or cranks with their varying torque at different positions, and the power demand is limited to the time during which the hoist is in actual operation. This feature minimizes the amount of power consumed. Under space conditions it is possible to employ a system of regenerative braking, the weight of the descending carrier driving the motor as a generator, and thereby feeding back an appreciable amount of current into the distribution system.

The intermittent service of hoists involves a necessity for certain precautions in resuming the operation of steam hoists after they have been shut down which are entirely absent when the electric type is used. If water collects in the cylinder of a steam hoist it must be thoroughly drained before starting the hoist to avoid the danger of blowing out the cylinder head, and in cold weather this is frequently complicated by the formation of ice in both the cylinder and pipe line.

necessity for the service of an engineer in running it, as the average worker is competent to receive the limited amount of instruction necessary and can be safely entrusted with its operation. Emergency demands on the ability of the operator are, as a rule, reduced by providing safety devices in the form of signal lamps, bells, or automatic cutouts, and for conditions such as those imposed by the use of motors for driving the type of water hoist commonly found in the anthracite fields, the hoisting equipment can be made entirely automatic in operation.

Owing to the wider range of speed control which is obtained in hoists driven by direct current motors, this type is very largely used, but in many of the later installations polyphase induction motors having a resistance connected in the rotor have been applied to this service with entire success, and simple and thoroughly reliable controllers can readily be provided to secure the variations in speed required for coal mine hoisting.

#### Mine Pumps.

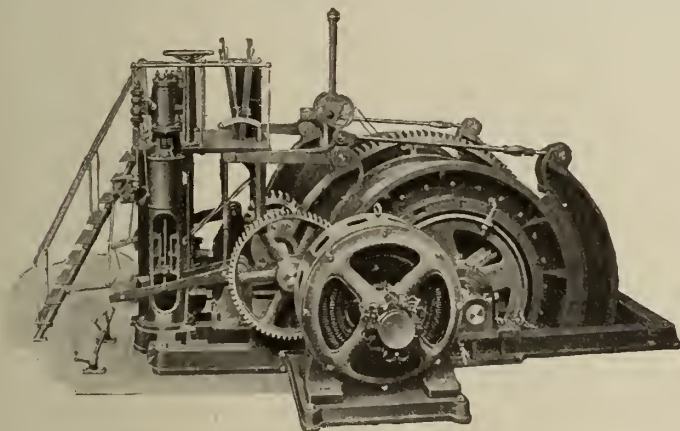
The relative importance of the pumping equipment in different coal mines is dependent upon the geological conditions encountered. In many mines the service re-



quired constitutes a comparatively negligible demand on the power station, owing to the possession of natural drainage facilities, with a resulting limitation of the pumping units to those required for boiler supply, fire protection, and a few dip pumps operating at low heads.

On the other hand, a large percentage of the mines situated below local water levels are absolutely dependent for continuous operation on the efficacy of their pumps or water hoists, and the cost of their operation has a vital influence on the obtainable margin of profit. The importance of this factor can be fully appreciated when it is realized that in many mines more than ten tons of water have to be elevated to the surface for every ton of coal mined. In addition to this, the pumping outfit must ordinarily have sufficient reserve capacity to cope with excessive demands due to floods, having their source either on the surface or in water bearing ground which is likely to be encountered in extending the workings.

Two facts have contributed to simplify the problem of the main pumping units in coal mines. First, the recent remarkable improvement in the efficiencies of multi-stage centrifugal pumps, which were formerly only applicable to comparatively low head service, but



Electrically Operated Hoist

are now successfully delivering water from sumps located more than one thousand feet below the surface; the best results being obtained when they are driven by motors which are direct connected, thereby avoiding the friction losses of gear drive, the high speeds which are characteristic alike of the electric motor and the centrifugal pump rendering it a simple matter to design a very effective combined unit. Second, the feasibility of providing existing pumps or water hoists, originally designed for steam operation, with motor drive which at once greatly reduces the amount of power required and the expense of attendance necessary, and can safely be made automatic in operation, if desired.

Where motors are geared to reciprocating pumps their use insures the direct application of a larger percentage of the initial power developed than other methods, and many pumping sets of this class are still employed, although the centrifugal type is usually adopted for new installations.

The pumping units of a representative "wet" coal mine can be roughly divided into four classes, i.e., sinking pumps, used in development work, in sumps or for emptying flooded mines; main sump pumps, permanently installed in the mines; auxiliary pumps feeding into a central sump; and portable pumps for temporary service or removing small amounts of water from depressions beyond the reach of the stationary auxiliary

pumps, or for fire fighting. There is also a fifth class which, however, is common to all power station service, and includes those units which provide for boiler feed and general water supply.

The motor-driven sinking pump must, of necessity, be capable of maintaining good efficiencies under fluctuating heads, and in some instances must be capable of operating when entirely submerged. When used in slopes, it is generally mounted on rails or a car to facilitate the movement necessitated by following the receding water level, but if it is serving a shaft it is either mounted on a float so that it will always operate at the surface of the water, or is supported by chains or cables so as to permit of the necessary adjustment. In all cases the power is supplied by flexible cables of sufficient length to meet all variations of the operating level, and as they occupy but little space they leave the shaft or slope practically free from any encumbrances, and as provision need only be made for the discharge pipe and the electrical conductors, they can usually be run in one of the hoisting compartments. Induction motors should preferably be used for sinking pumps, especially if they are liable to be submerged, as this type, due to its simple construction and the absence of moving electric contacts, need not ordinarily be enclosed, but the factor of safety is very greatly increased by using an enclosed motor with waste packed bearings, the use of stuffing-boxes not being essential.

In sinking pumps the load increases inversely as the head against which the pumps are delivering water and, as a rule, the limits can be approximately predetermined and the motors so designed that from the start the efficiency increases with the increasing head. Both alternating and direct current motors with either horizontal or vertical shafts can be readily adapted to all forms of sinking pumps, the type of motor selected depending upon the service required and the character of the electrical energy available.

The main sump pumps are usually of large capacity, and their energy requirements often constitute a large percentage of the generating station output. Where the sump is of sufficient size to store the water normally collected during the day, the cost of this demand on the generating equipment may be minimized by running these pumps at night, in this way tending to equalize the power station load and permit the operation of a mine or colliery with a much smaller capacity in generators than would be required if these large pumping sets were run as a day load.

The adoption of the centrifugal type of sump pump in coal mines is due not only to the improved efficiencies of the modern multi-stage form, but also to the ability of the centrifugal type to handle liquids containing a considerable percentage of solid matter in suspension more successfully than reciprocating pumps. Moreover, its design and practically uniform load when serving sumps permits direct drive by means of high speed motors, preferably of the constant speed polyphase induction type where alternating current is obtainable. As single pumps capable of delivering water to the surface from any depth required in coal mining, at one lift, can now be run with greater economy, both as to first cost, and power consumption, than a number of units of low head and equal capacity, the once common practice of raising the water to the surface in successive lifts to sumps located at different levels has been practically abandoned.

For draining portions of the mine which are below the level of the sumps, a number of comparatively small pumps are ordinarily required, and as the difference in



the water levels is not usually great these pumps are, as a rule, standardized for the maximum head against which they will have to operate. This seldom exceeds 300 feet and in some mines is as low as 15 feet. Owing to their relatively large number and scattered location, these pumps are usually driven by direct current motors and operate from the locomotive feeder wires, although they are sometimes served by cables run into the mine through a centrally located bore hole. They are frequently semi-portable, so as to facilitate their movement or replacement to meet the varying requirements developed by the constantly changing conditions incident to coal mining. Like the main pumps, they normally operate without attendance except for occasional inspection, cleaning and lubrication, and can be equipped with automatic control, if required.

Perhaps the best demonstration of the superior flexibility of electrical operation in coal mines is found in the portable pumping set, which can be lowered down the shaft or slope and rapidly hauled to any portion of the mine by a locomotive and immediately put into service by connecting the suction pipe, unreeling the discharge hose and connecting the motor leads to the locomotive feeder wires. The equipment varies in details, but not in essentials at different mines, and consists of a centrifugal or plunger pump direct connected or geared to a direct current motor provided with a simple drum controller. There is also a suction pipe with a strainer end and a discharge pipe or hose reel, and if the set is intended for fire service, the necessary fire fighting auxiliaries are included. The complete outfit is compactly mounted on a truck having the same wheel gauge as the mine locomotives. It constitutes a valuable adjunct to the ordinary pumping equipment, as it can be used in all emergencies to replace any pump of approximately the same capacity which may be shut down for repairs or other reasons, and for intermittent dip pumping roadways where the expense of drainage grading would not be justified and a permanent pumping set would not be economical, owing to the short and irregular periods of operation.

#### **Ventilating Fans and Air Compressors.**

Uninterrupted service is the primary requisite of a coal mine ventilation system. The imminence of the hazard to the workers underground involved in a failure of the supply of fresh air being, of course, dependent on the character and formation of the mine.

Mechanical ventilation by means of rotary blower or exhaust fans which give a positive and fully controllable supply of air is almost universal in coal mines, the furnace system being used only in small isolated mines, or as a temporary arrangement in some of the larger ones, while the water fall or trompe ventilator or the steam jet or water jet methods are rarely resorted to. In driving ventilating fans with electric motors it is customary to couple the motor and fan shafts together and avoid the use of belting, as the nature of the load is such that with high speed fans direct drive minimizes the power requirements and economizes space.

Where large slow speed fans are changed over from steam to electric drive the retention of belting is often necessary, due to the difference between the speeds of the fan and the motor, but with both forms of electric drive the reliability of the service is increased, attendance cost reduced, and better speed control assured, while the installation of the fan itself is not influenced by the location of the power house. Where remote control is desirable, as in the case of fans situated at a considerable distance from the central or substations, it can be accomplished with remote control switches and any inter-

ruption of the service indicated promptly by connection alarm lights or bells in the motor circuit.

For mines using induction motors for other work, the question of adopting synchronous motors for driving the fans should be carefully considered, especially if the induction motor load is such as to seriously affect the power-factor of the generating and distribution systems, as by utilizing synchronous motors of higher rating than is actually required for driving the fans, their excess capacity may be devoted to correcting lagging power-factor by supplying leading current to the distribution system. This will frequently obviate the necessity for providing unloaded synchronous condensers to counteract the influence which underloaded induction motors and transformers have on the power-factor, and consequently the effective capacity of both generators and conductors.

When compressed air machinery is required in coal mines, electric drive renders it possible to locate the compressors with a view solely to securing the best air service irrespective of the location of the prime movers, in contradistinction to the necessary limitations of steam-driven air compressors. The motor operated units may be installed in distant substations or in the mines, and as a result short pipe lines with a correspondingly reduced pressure drop may be used, while individual compressors can be provided for isolated working sections.

If automatic unloaders are used with the compressors to regulate the pressure, and by-passes provided so that the motor is enabled to start at very light loads, the conditions are most favorable to the use of synchronous motors on slow speed reciprocating compressors, as very little overload capacity is then required in the motor, and it may be designed as in the case of those driving ventilating fans to compensate for conditions of low power-factor.

It is not usually advisable to drive high speed centrifugal air compressors with synchronous motors, as the best operation of this type can be secured by the use of high speed induction motors. Both types of motors can ordinarily be direct connected to the compressor shaft, but belting is of necessity sometimes retained in changing over from steam to electric drive.

#### **Rock and Coal Crushers.**

When motors were first applied to the centrifugal type of rock and coal crushers it was considered advisable to retain belt drive, due to the onerous starting conditions, excessive vibration and the possibility of the severe operating requirements resulting in stalling or injuring the motor. Familiarity with the use of electric motors, however, induced many of the engineers of the mining companies to attempt direct drive and both alternating and direct current motors are now successfully applied in this manner, being connected to the crusher shaft through flexible couplings.

When driving these crushers with engines it was necessary to utilize belting in order to obtain the required speed, and space economy was attained by installing the engine close to the crusher and reducing the belt-slip caused by the short arc of contact by interposing idlers. This was accomplished at a sacrifice in the power applied in useful work and the cost of belting renewals was excessive, amounting in some cases to approximately \$100 per month for a single crusher. It is manifest that direct motor drive not only eliminates this expense, but reduces the amount of space necessary, while at the same time applying a greater percentage of the power in useful work.



The efficiency of motor drive for coal crushers as measured by the output in crushed coal for a given motor capacity was recently demonstrated by an exhaustive test conducted for the United States Coal and Coke Co., at Gary, W. Va.

A 200 h.p. General Electric induction motor was direct connected to a crusher having a normal output of 200 tons per hour, which, during the test, delivered 262 tons of crushed coal per hour without exceeding the guaranteed temperature rise in the motor. Owing to the heavy starting torque and severe intermittent overloads to which a motor must necessarily be subjected in this service, the polyphase induction type should be used when alternating current is available. If direct current motors are used with either rock or coal crushers, they should be enclosed to avoid commutator trouble from abrasive or conductive dust; reference to the accompanying illustrations of coal crushers driven by induction motors will show that this type need not ordinarily be enclosed.

While the above references have considered only the centrifugal type of crusher the electric motor can be adapted to any form of coal breaker, disintegrator, roll crusher or pulverizer, and where their operation calls for relatively slow speeds standard back geared motors can generally be applied.

#### Breakers and Tipples.

The earliest attempt at individual motor drive was made with direct current enclosed motors, and was only partially successful, as the intense vibration inseparable from breaker operation tended to cause commutator troubles.

In those breakers where induction motors were used, the simplicity of the rotor and the absence of moving electrical contacts resulted in a practically complete immunity from motor troubles, and the breakers were supplied with current from a central generating station; no local reserve power plant being required.

For driving tipples individual motors have heretofore been more generally used than in breakers, and the typical modern steel tipple is usually equipped with separate motors for the conveyors, picking tables, screens, crushers, etc., although in some cases they are driven in groups by one or more large motors.

Where long conveyors or scraper lines are used the power waste inherent in rope transmission may be reduced by using a centrally located motor or individual motors for separate sections. If extensions to the system are made, as in the case of conveyor lines to culm or refuse piles, the additions may be made without interfering with the operation of the original equipment, by providing a separate motor for each new section.

#### Coal Cutters.

The typical modern coal cutter shown herewith is mounted on a self-propelling truck and all its movements in loading upon or unloading from the truck, and during the process of mining, are made under its own power without hand labor. The motive power is supplied by a specially designed, enclosed, direct current shunt wound, vertical shaft motor provided with a simple rheostatic controller and wound for operating at the voltages commonly used for mine locomotives, so that current can ordinarily be supplied by the generator equipment provided for haulage, and as the mining machines are usually in service at night their use does not as a rule call for any increase in the generator capacity.

The first generators in the older developments were direct current units provided for lighting and locomotive haulage, and were usually belt connected to exist-

ing engines, direct connected sets being adopted for additions to the original outfit. Engine driven alternators were eventually added as the transmission distances increased beyond the economical range of direct current, but many isolated mines are still equipped for direct current service only. The increasing use of alternating current motors and the high combined efficiencies of high speed turbine driven alternators led to the choice of high pressure turbines as prime movers for most of the new power plants, or else mixed pressure or low pressure turbines were adopted to supplement the engine equipment as they could ordinarily be operated with the exhaust steam of the engines already installed and in this way added greatly to the generator capacity of the power station without requiring extra boiler capacity.

Comparatively high transmission voltages are now commonly used in this industry and most of the recent substations are constructed and equipped in accordance with the most advanced engineering practice, while on the other hand many mining plants illustrate in their miscellaneous electrical equipment the successive stages in the advance of electric manufacture during the past twenty years.

#### U. S. RADIUM PRODUCTION.

The U. S. production of carnotite bearing ores during 1913 was the largest to date, and amounted to about 2,269 short tons of dry ore, which contained about 81,990 lb. of uranium oxide, equivalent to 34.8 tons (31,560 kilograms) of metallic uranium. Rutherford has estimated that the quantity of radium in equilibrium with uranium is equivalent to about one grain of radium to 3,000 kilograms or uranium, and workers in the U. S. Bureau of Mines have estimated that the uranium in carnotite is accompanied by about 90 per cent of the radium required for equilibrium. On the supposition that these figures are approximately correct and that 90 per cent. of the radium present is recoverable, then the ores produced contained 8.5 grams of recoverable metallic radium, equivalent to 15.9 grams of hydrous radium bromide, valued, at \$120,000 a gram of metallic radium, at \$1,020,000.

In the United States uranium minerals were produced in commercial quantities during 1913 only in Colorado and southeastern Utah, and the quantity produced in Colorado was much in excess of the Utah output. The great bulk of the uranium mineral was carnotite, but a small tonnage of pitchblende ore was taken from the Belcher and Calhoun mines, near Central City, Gilpin county, Colo. Only a few pounds were sold, and this was apparently for specimens or experimental use. Fifty dry tons of low grade material, carrying 1.49 per cent. uranium oxide, was shipped from the Kirk mine, which lies adjacent to the Calhoun and Belcher mines. This material had been mined in a previous year and had been picked over for pitchblende several times. It was too lean to ship under ordinary circumstances, but was bought by a French firm for experimental treatment.

#### KERR LAKE.

Kerr Lake Mining Co. during the year ending August 31, made a profit of \$620,786. There was produced 1,828,424 oz. of silver at a cost of 24.86 cents per oz. The company's surplus August 31 was \$961,094. The manager estimates ore reserves at 5,698,700 oz. and expects his estimate to prove a low one.



## SOME MEMBERS OF THE STEFANSSON EXPEDITION.

Included in news published recently in daily newspapers relative to the rescued Karluk party, which last month reached Nome, Alaska, and three men who died on Wrangel Island, there was mention made of the death of George Stewart Malloch, geologist. The late Mr. Malloch was one of several members of the Geological Survey of Canada who joined the Stefansson Arctic expedition. He had been on the staff of the Survey seven or eight years. The field work seasons of 1906-7-8 he spent in coal areas on the eastern slopes of the Rocky mountains, Alberta. In 1909 he was engaged in reconnaissance work along the line of the Grand Trunk Pacific Railway, on the upper Fraser river, between Fort George and Tete Jaune Cache, British Columbia. In 1910 he was with Mr. R. G. McConnell in Portland Canal district, B.C., of which he made a topographical survey, while Mr. McConnell and an assistant did the geology of the region covered. In 1911 he examined a portion of the Groundhog coal basin at the head of the Skeena river, north of Hazelton, B.C., a district which at that time was attracting much public attention. In 1912 he continued his reconnaissance of the Groundhog basin, determining the southern, eastern and northern boundaries of this coal area. A long report on that field, as well as his report on the metalliferous deposits in the vicinity of Hazelton, was included in the Geological Survey Summary Report for 1912. Having volunteered for geological work in the Arctic regions as a member of the Stefansson expedition, he was in Victoria in June of 1913, on his way north, as it has now proved, never to return. He was a much valued member of the Geological Survey staff, and his untimely death is much deplored. His age was about 30 years. He was a son of Dr. Malloch, of Hamilton, Ontario, and a graduate of Queen's University, Kingston. His name appears in the directory of the graduates of the School of Mining, Kingston, as "B.A., 1902, B.Sc., mineralogy and geology." He was also a member, ex officio, of the Canadian Mining Institute.

Information has been received concerning other members of the Stefansson party, these having been at work on or in the neighborhood of the Mackenzie River delta. A despatch to the New York Times, published several weeks ago, included news of three members of the Geological Survey, namely, Kenneth G. Chipman, J. R. Cox and J. J. O'Neill, as follows:

"Kenneth G. Chipman, chief topographer, and Dr. J. J. O'Neill, geologist, are now working in the west branch of Mackenzie delta, and will survey the branch in a launch as soon as the river opens. John R. Cox, topographer, will survey the east branch of the delta.

"Chipman and Cox have completed a survey from the Alaskan boundary to the Mackenzie, and O'Neill and Cox have surveyed a large part of Herschel island.

"All the members of the expedition are in good health and prospects of accomplishing some work next year are good."

The despatch was from Rudolph M. Anderson, of the Canadian Arctic Expedition, and was dated from Escape Reef, West Edge of the Mackenzie Delta, May 16, via Athabasca, Alberta, May 31.

A short time ago Mr. G. G. Aitken, Chief Geographer, Lands Department, Victoria, B.C., received a let-

ter from Mr. Chipman, in which was given much information about the work that he had been engaged in up to the time of writing. Some accompanying notes, dated Fort McPherson, N.W.T., July 7, 1914, were as under:

"On March 16 Cox and I left Collinson point, and went to Herschel island. There we separated, he mapping the Firth river and then spending the spring on the coast line, while I went directly to Iglukitaktak, in the Mackenzie delta, where I waited for open water. This came on June 4, and I spent the rest of the month mapping in the delta, arriving here on July 1 to meet the steamer with our mail and freight. Cox got in here on the 3rd. The steamer is now daily expected. I do not think I ever before in my life looked forward to anything as anxiously as I now do to whatever that steamer has for us. It is more than a year since I was with you in Victoria, and I have frequently, especially during the last month, thought of the pleasant times I enjoyed there."

While Mr. O'Neill's previous geological work in recent years was done in the provinces of Quebec and Ontario, Messrs. Chipman and Cox were for several field seasons employed in the Canadian West. On June 26, 1908, Mr. Chipman arrived in Victoria from Ottawa with Mr. Chas. H. Clapp, whose assistant he was, to commence a geological and topographical survey of the southern portion of Vancouver island, which important work was begun on July 1 and continued well into the autumn. In the 1909 field season he assisted Mr. R. H. Chipman, who in that year commenced the preparation of topographic map of Vancouver island. In 1910, when this work was continued, Mr. Chipman had charge of the party which began the survey of the Sooke sheet, and in 1911 he spent the season in mapping the Cowichan Lake sheet. The field season of 1912 he was engaged on the Windermere map area, and in his brief published report mentioned that district as "scenically one of the most beautiful in Canada, each year receiving more attention from mountaineer and tourist, and, with the completion of the automobile road across the main range of the Rockies from Banff to Windermere, will be one of our most attractive mountain resorts." He, too, was in Victoria last year en route to the north with the Stefansson party.

Mr. Cox was one of the assistants of the Chief Topographer of the Geological Survey, Mr. W. H. Boyd, in the Slocañ and Boundary districts in 1910, and in the Blairmore-Frank district, Alberta, in 1911, while in 1912 he was with Mr. Chipman in the Windermere district, B. C.

## FIRE PROOF ROOFING.

In the city of Hot Springs, Ark., a disastrous fire recently swept through several blocks of the residential section, consuming everything before it except four houses covered with asbestos roofing. A strong wind—almost a gale—carried burning embers and shingles hundreds of feet; and although the roofs of these houses were at times covered with flaming shingles and sparks they did not ignite. In fact, the fire in this direction was entirely checked, showing that an efficient fireproof roofing is not only of immense value to the building it actually covers, but is also a preventive of large conflagrations.



# ROCK DISTURBANCES THEORY OF PETROLEUM EMANATIONS vs THE ANTICLINAL OR STRUCTURAL THEORY OF PETROLEUM ACCUMULATIONS

By Eugene Coste.

Although some of the observers who first paid especial attention to the occurrences of oil and gas in the strata (such as Hunt in 1859, Andrews in 1861, Winchell in 1865, Mendeleeff in 1876, Hofer in 1876, Minshall in 1881, and I. C. White in 1883) seem to have been impressed with the fact that oil and gas deposits were connected with the disturbances in the rocks caused by their upheaval, yet, with the exception of Mendeleeff, and possibly Andrews, these observers do not appear to have understood what is really the one essential factor in the occurrence of oil and gas in the strata: viz., the faulting, uplifting, fracturing, fissuring, and jointing always accompanying even slight rock disturbances, and in certain districts (petroliferous provinces) allowing solfataric hydrocarbon emanations to force their way up from the interior and to reach and impregnate the porous portions of sediments subjected to the disturbances. Instead of this simple explanation to account for the observed connection between petroleum deposits and rock disturbances, most of the observers mentioned above, and many others who have followed them on the same lines since, have entirely reversed the problem. To them, instead of the dissemination of gases from fissures into the sediments, it presented the accumulation and concentration, according to anticlinal or other geologic structures, of oil and gas originally present throughout the whole mass of the strata where they were produced by the decomposition or distillation of organic remains.

Whether this important problem involves accumulation from sources within the oil-bearing strata themselves, or infiltration and dissemination from outside sources, may be easily determined if all preconceived ideas are put aside and the established facts only are considered.

## Physical Facts.

Sedimentary strata are composed of alternate beds of shales, sandstones, and limestones, most of which are sufficiently close-grained to have retained from the time of their deposition enough water, held in their minute pores by capillary action, to fill all the spaces between their grains and render them entirely impervious to other fluids. Shales or consolidated clays form the bulk of the sediments and are especially fine-grained saturated impervious rocks, but many beds of sandstone or limestone are also quite impervious. Carll, Lesley, White, and Orton have often referred in their reports to the wonderful impermeability of the sedimentary strata of the oil regions. A sufficient proof is the very strong natural gas pressures always recorded in the gas and oil deposits, and the great differences in the pressure of the gas of different sands tapped at various depths in the same well, or in nearby wells in the same pool or field. These strong pressures and wide differences in pressure have been noted in thousands of wells drilled in the 10,000 or 12,000 ft. of sedimentary strata along the Appalachian oil belt, for instance, from New York State through Pennsylvania, West Virginia, Ohio, and Kentucky to Tennessee.

In order to explain the retention of this gas under strong pressures (up to 1,500 lb. per square inch in some

cases) in so many thousands of separate spots and at depths sometimes as shallow as 100 ft. and varying from that to 4,000 ft., we must certainly conclude that the sedimentaries forming the substrata of this vast region and ranging through many geological ages are remarkably impervious. It is for this reason alone that the petroleum deposits have not escaped to the surface, and have been preserved in a multitude of separate pockets, pools, or fields, with different pressures, though often quite close to one another and always comparatively near the surface. Yet without an iota of evidence we are asked to admit the reverse of what we see everywhere to be the case; and we are told by the advocates of the anticlinal theory that these impervious rocks which confine the gas and oil in their present reservoirs are themselves the source from which these substances were obtained. If it is impossible for the natural gas, notwithstanding its strong pressure, to traverse the 100 ft.—or the 3,000 or 4,000 ft. at the most—which separate it from the surface, it is still more clearly impossible that it could have accumulated, according to the anticlinal theory, by traveling miles through the same surrounding rocks to its present reservoirs, from supposed minute organic sources distributed throughout the very same impervious sediments.

Again, if, as required by the anticlinal theory of oil and gas accumulation from within the sediments themselves, these products could circulate freely through the minute pores and mass of the shales, such a movement could and would have commenced immediately after the deposition of the sediments, while they were still lying flat and undisturbed. It is entirely superfluous to assert that the upward movements of the petroleum in the sediments were started by a slight folding of the rocks, either in the form of an anticline or any other form, "by which the oil, gas and water may have been separated out and the oil concentrated in one locality." The supposed organic petroleum products if they could move freely through the sediments, whether from the action of gravity, hydraulic pressure, or any other cause, would certainly start up toward the surface as soon as formed; they would never stop until reaching it; and therefore there would be no oil or gas at all found in the sediments to-day. In the Californian fields, Madill, Wheeler and other fields in Oklahoma, the Athabasca region of Canada, and many others, the productive sands are in unconformable formations, and sometimes right above the unconformities. To suppose that in these cases the petroleum in the lower bed of the Cretaceous, for instance (Dakota sandstone in Canada, or Trinity sandstone at Madill), is derived from the unconformable Paleozoic rocks underneath, is to ignore the long lapse of time between Paleozoic and Cretaceous times, which was certainly sufficient to exhaust out of the Paleozoic into the air, long before the deposition of the Cretaceous beds, all petroleum products formed from the decomposition of Paleozoic organic remains. If several unconformable formations (and in California there are at least three or four marked unconformities between different productive



sands) contain petroleums in the same district and none at all in other districts with the very same sequence of formations, it must be due to some source for the petroleums outside of all these sediments, and to some infiltration, at a period more recent than the youngest productive formation, from a source beneath the oldest.

In all cases, therefore, the anticlinal theory of petroleum accumulations from sources within the sediments themselves fails to explain how the petroleums could possibly enter the porous portions of the sands, and remain there, and not continue their migration to the surface. On the contrary, solfataric petroleum emanations, through the agency of rock disturbances and fissuring, may enter and be retained in a patch of porous sands entirely surrounded by impervious rocks and there separate their component hydrocarbons and associated gases and vapors more or less according to gravity, the gas working its way to the higher parts of the porous sands, the water, if any, remaining in the lower parts, and the oil floating on the water, between it and the gas. In dry sands, such as the deep sands of Pennsylvania and West Virginia, the oil will naturally work down more or less to the lower part of the porous portions impregnated and will often be found in synclines. That part of the anticlinal theory which provides for a certain amount of separation of the water and of the different petroleums once they have reached a porous reservoir, is, of course, true. But even this has been much exaggerated; since the sand reservoirs in the oil and gas fields are very irregularly porous, and far from forming ideal tanks like a bottle or a room. Many impervious streaks or patches of various forms are found in the very heart of their porous portions, and they are seldom continuously porous over large areas. During the periods of disturbance there was also much fissuring and jointing; and, under the strong pressures of the gas always present in the petroleum emanations, these irregular tanks could not be filled up in the theoretical manner mentioned above. Every day, in the drilling of wells this theoretical arrangement of gas first, in the higher portions of the reservoirs, then oil and then water, is entirely reversed. Every day dry holes or oil wells, or salt-water wells are "drilled in" on the top of the anticlines while large gas wells are obtained away down on the slopes or at the bottom of synclines. On the other hand, many anticlines are barren of petroleums, although these anticlines are developed in sedimentary formations where every requisite condition demanded by the anticlinal theory is absolutely fulfilled; namely, fossiliferous strata; porous arched reservoirs; impervious covers; and water in the porous rocks; but where the essential factor is missing, namely, the rock disturbance producing the necessary fissure through which the solfataric hydrocarbon emanations could force their way up to the porous reservoirs.

The structure of many an oil or gas field has no resemblance to an anticlinal structure. A. Beeby Thompson in a paper read before the Institution of Mining and Metallurgy of London, England, in which he reviews the relationship of structure to the occurrence of petroleum, graphically illustrates by many good sections the great diversity of oil and gas field structures and thus plainly demonstrates the reverse of what he advances in the text: namely, that oil and gas fields are generally connected with anticlines and that "an anticlinal structure favors the accumulation of oil" and "played a most important part in the formation of oil fields." Indeed, a number of prolific and prominent oil fields are shown by Mr. Thompson's diagrams to

exist in strata presenting structural conditions entirely different from anticlines. Other instances and examples to show that oil and gas fields are found under all sorts of structural conditions have been often furnished by other writers in their studies of the different oil fields of the world, especially of America. It has been found necessary really to transform the anticlinal theory by expanding it into a structural theory including all sorts of other forms. This structural theory was elaborated by F. G. Clapp in his papers in *Economic Geology* (vol. v, No. 6, Sept., 1910, pp. 503 to 521, and vol. vii, No. 4, June, 1912, pp. 364 to 381). What the author principally proves from his classification of oil and gas fields is really petroleum deposits are not dependent on or controlled by any kind of structure whatever. Such deposits are found, according to this classification: (1) on strong anticlines standing alone; (2) on well-defined alternating anticlines and synclines; (3) on monoclines with change in rate of dip; (4) on structural terraces; (5) on broad geanticlinal folds; (6) on bulged anticlinals; (7) in saline domes; (8) around volcanic rocks; (9) along sealed faults; (10) sealed in by asphaltic deposits; (11) at contact of sedimentary and crystalline rocks; (12) in joint cracks of sedimentary rocks; and (13) in crystalline rocks. To these classes of deposits may be added the following: (14) on gentle slopes or monoclines without any change in the rate of dip, as the Welland field, Ontario, the Madill field in Oklahoma, etc.; (15) in vertical veins cutting across the strata such as the gilsonite veins in Utah, the albertite vein in New Brunswick, Canada, and the grahamite vein near Cairo, West Va.; (16) in quicksilver and other metallic veins; (17) in and along volcanic or igneous dikes; (18) in meteorites; (19) in the volcanic emanations of to-day; and (20) in synclines.

With so many different classes of petroleum deposits, it is clear that the structure in itself is not the controlling factor and that too much weight has been attached to the form of folding of the sediments surrounding the petroleum deposits. In order to make the anticlinal theory fit everywhere unwarranted new names have been given and supernatural properties have been attributed to certain structures (such as "arrested anticlines" and "quaquaversal domes") which in no possible way could of themselves affect the oil or gas accumulations.

Even along the Appalachian oil belt, which is supposed to give many typical examples of anticlinal structures, it is well known that the oil and gas fields are really in the bottom of a deep geo-syncline between the Cincinnati anticline and the Appalachian uplift. These so-called anticlines, on which the oil and gas fields have been developed in that region, are mere wrinkles of small amplitude in the bottom of that deep geo-syncline. The height of each wrinkle is only a few hundred feet at the most, and therefore (if the sands were continuously porous, and the strata in general were as permeable as the anticlinal theory requires to explain the accumulation of the large quantities of petroleums obtained), the oil and the gas would not have stopped on or near the summit of arch of these wrinkles of porous sands, but, if the covers of these sands were impervious, would have traveled along the sands from one arch to the other and gradually up the western or the southern slope of the geo-syncline until reaching the surface at the outcrops of the sands in Ohio, or northern Pennsylvania and New York State. Many differences in pressure have been noted between the gas found on one of the wrinkles and that in the same sand on the adjoining one. The few hundred feet of water in the syncline between these



two wrinkles could not possibly prevent the gas from traveling from one to the other and equalizing that pressure, and, as I have said above, could not possibly prevent the gas from getting out up the slopes of the geosyncline to the outcrops.

In the Gulf oil fields of Louisiana and Texas, it is still more clearly evident that the particular shape or structure of the salines or mounds was not a factor in the accumulation of oil from the surrounding sediments. These salines cover indeed such small areas that it is only a stretch of the imagination to suppose that the enormous quantities of oil obtained from under them could possibly be derived from the strata affected by what has been called the "quaquaversal doming" under the salines. Moreover, this doming does not extend to the Tertiary or Cretaceous clays and sands surrounding the salines or mounds; and therefore this particular structure could not be a determining factor of oil accumulations from the surrounding sediments. On the contrary, it is well established that the sediments under the salines have been replaced by masses of salt, limestone, dolomite, silica, sulphur, and gypsum, of secondary origin from solutions moving vertically and carrying hot oils, hot water, and hydrocarbon and sulphur gases, and that these products did not extend horizontally into the impervious sediments surrounding the chimney-like channels under the salines; also, that these salines are distributed along lines of deep faults which were evidently the first channels for emanations of the hydrocarbons and other vapors and waters, before they finally came out to, or near, the surface through the chimneys under the salines. What has structure to do with occurrences of oils in deposits of this kind, which are clearly due to the rock disturbance under the salines, and to hot gasaqueous emanations coming up from below? This explains the fact that oil in large quantities is "struck" at many different levels under the salines, and none is struck, outside of the salines, in the surrounding sediments.

That these are solfataric volcanic emanations is made plain by the occurrences of oil a little further south, along the same coastal plain, in Mexico. There one can actually observe numerous volcanic necks of olivine basalt, scattered at wide intervals, and also distributed along fault lines similar to the lines connecting the salines of Texas and Louisiana; and these volcanic necks are surrounded by large seepages of asphalt and the very prolific oil fields of this region are all developed in close proximity, around these volcanic rocks. F. G. Clapp in a paper in *Economic Geology* (vol. vii, No. 4, June, 1912) says with regard to this class of oil deposits in Mexico:

"In close proximity to the basaltic upheavals, the Tamasopo limestone and overlying formations have been domed upward, forming pockets or places of change in rate of dip at the base of the upheavals and surrounding them, where large deposits of oil have accumulated."

It is known, however, that these Mexican lava cores form really vertical pipes, which may be said to have drilled themselves upward through undisturbed and almost horizontal strata of shales, limestones, and sandstones, and Mr. Clapp himself admits that in his hypothetical cross-section of one of the Mexican oil-fields. The supposed action of the doming referred to by Mr. Clapp would therefore have been so infinitesimal as to be entirely negligible in considering the accumulations

of oil out of the surrounding sediments. According to Mr. Clapp's theory the Cretaceous sediments surrounding the lava cones of Mexico tenaciously held back in their pores, during long ages, enormous quantities of petroleum products, until such time as the volcanic peaks and needles pierced through them in late Tertiary times. In doing so the volcanic cores tilted only very slightly the sediments immediately surrounding them. It would be impossible for this slight tilting of very small portions of the whole mass of the strata of this region to effect the immediate release from these sediments of the enormous quantities of oil supposed to have been so firmly held by them during long periods; and it can only be concluded that the effect of structure in this case at least has evidently been much overdrawn. Why should so much be demanded from poor impotent structure alone, when it is manifest that these Mexican petroleum deposits are directly connected with vulcanism, and due to solfataric volcanic emanations accompanying the upheavals of the basaltic cones?

Many other instances to show that structure is not a determining factor in the migration and accumulation of oil in the California fields may be found in the reports of Arnold, Anderson and Johnson. These authors summed up their conclusions as follows:

"This migratory faculty may be ascribed entirely to the presence of the associated gas which would cause the oil to fill every crevice offering a point of escape or a point of lodgment."

"The condition of the rocks is the chief factor that controls the matter of where the oil is stored most abundantly"

In California, "many of the 'oil sands' so called, are not true sands, but zones of fractured shale or flint offering interspaces in which the oil can gather."

"Large accumulations in anticlines may be accounted for primarily by the cavities offered by the strata along upward folds, and secondarily by the presence of less pervious beds arching over such folds and affording favorable conditions for the confinement of oil and gas tending to escape."

If to these conclusions is added the consideration of the many strong faults and disturbances always plainly in evidence in the fields of California, and also the consideration of the fact that in these fields a number of unconformable formations, from and including the crystalline gneisses to the Quaternary, are productive of oil, it will be readily understood that the migration of oil is effected vertically along fissures and from a source beneath the crystalline gneisses instead of horizontally and more or less under the determining influence of the structure.

The same conclusion has been reached by Washburne in the Florence field of Colorado: viz., that geologic structure has had little or no influence on the movement or the accumulation of oil which is present mostly in open fissures in a zone of shales 2,500 ft. thick, at the bottom of a syncline.

#### Geologic Facts.

Simple and well-known geological conditions and considerations prove just as conclusively that the occurrences of oil and gas in the strata can only be attributed to a process of infiltration, dissemination, and impregnation of the porous portions of the sediments from deep solfataric volcanic sources. As I have already on several occasions\* presented in detail a number of facts and

\*Natural Gas in Ontario, *Journal of the Canadian Mining Institute*, vol. iii, pp. 68 to 89 (1900). The Volcanic Origin of Natural Gas and Petroleum, *Journal of the Canadian Mining Institute*, vol. vi, pp. 73 to 123 (1903). Petroleum and Coals, *Journal of the Canadian Mining Institute*, vol. xii, pp. 273 to 301 (1909). The Volcanic Origin of Oil, *Trans.*, xxxv, 288 to 297 (1904). Fallacies in the Theory of the Organic Origin of Petroleum, *Transactions of the Institution of Mining and Metallurgy*, vol. xxi, pp. 91 to 192 (1911-12).



arguments in support of these views, I will here only recapitulate the principal points as briefly as possible:

1. In the solfataric volcanic phenomena enormous quantities of hydrocarbon gases and vapors are constantly thrown out in the air in all the volcanic districts of the world. See my previous papers and Dr. G. F. Becker, Bulletin No. 401, U. S. Geological Survey, for short reviews of this evidence, which, however, will be found at length in the writings of the eminent geologists and chemists who have made special original studies on this subject, notably, Elie de Beaumont, Humboldt, De Lapparent, Suess, Fouque, Le Blanc, Silvestri, Stocklassa, Brun, Charles Sainte-Claire Deville, Lacroix, Gauthier, Tschermak, Janssen, Libbey and Sokolow. A. Gauthier, for instance, has shown not only that hydrocarbons and other combustible gases are to be found in the lavas or volcanic rocks of to-day, or associated with these rocks in their eruptions, but that enormous quantities of these combustible gases are contained also in ancient igneous rocks, and that by simply warming these rocks to a moderate red heat he could extract from them at least 100 times their volume of mixture of combustible gases and water vapor.

After giving the details of his experiments and analyses he says:

"Putting aside the reactions pertaining in the melted portion of the interior of the globe if we consider what happens when certain already crystallized masses of the crust are reheated to red heat on account of their sinking internally, or because lateral pressures of different parts of the crust cause an uplift of the melted rocks from the interior along the points of minimum resistance. When these rocks already solidified once are thus reheated by the incandescent masses it will be seen that they will be bound to give off by all possible vents the gases and vapors produced in the experiments just cited and recorded. From these, as we have seen, one liter of granite gave (at 1,000 deg. and calculated only for this temperature) about 20 liters of various gases and 89 liters of water vapor, that is to say, more than one hundred times its volume of gases. One can understand from this the great explosive force due to these reactions, and that it is not at all necessary to admit the hypothesis of the penetration of superficial or meteoric waters down to the igneous masses as a necessary condition to the production of volcanic phenomena. . . . One will understand that to explain the origin of the water in volcanoes the nature of the gases emanated and the violence of the eruptive phenomena, that it is sufficient for the deep crystalline strata to be reheated only a few hundred degrees, and the emanation of volcanic gases with their composition (combustible gases) and their formidable pressures, will be the necessary result of this reheating."

Dr. Albert Brun in his *Recherches sur l'Exhalaison Volcanique* gives many interesting analyses of the gases found in volcanic rocks, and given off at volcanic or explosive temperatures, that is to say, above 600 deg. or 800 deg. C., which he recognizes as the only true volcanic gases. These analyses show that hydrocarbons are frequent in volcanic rocks all over the earth and that they are sometimes quite abundant. For instance, in an obsidian from the Plomb du Cantal, France:

"The analysis showed that the vapor which is distilled is slightly ammoniacal and carries much bitumen. Heated in the vacuum its fused, vitreous residue is perfectly black with carbon. Moreover, there is enough bitumen present to form on the cold parts of the apparatus oily

striations. These oils are soluble in chloroform, with a brown fluorescence, and are combustible with a clear flame."

Many other analyses of lava, obsidian, and other volcanic rocks are stated by Dr. Brun to have given from traces of hydrocarbon to quantities even more abundant than in the instance cited above, and out of 67 analyses 38, or 57 per cent., gave hydrocarbons. The volcanic rocks containing the petroleum were from widely distributed localities, such as Mt. Erebus (antarctic), Armenia, Abyssinia, Java, Japan, Peru, Tamanfaya, Canaries, Iceland, Milo, Vesuvius, Stromboli, Etna, Arran Islands, Scotland, Sweden, Germany, Hungary, Italy and France.

In view of these and other evidences, no geologist can to-day deny that petroleum is now proved to be abundantly produced in the phenomena of vulcanism, whether recent or ancient.

2. There are no geological phenomena of to-day or of ages past in which, through organic agencies, petroleum—that is to say, the mixtures of hydrocarbons known as petroleum—are being produced, or are known to have been produced. The gradual decomposition of entombed vegetable organic matter in nature to-day, and during the past geological ages, is and has been accomplished in the sedimentary strata at low temperatures and has resulted in the formation of peat, lignite, coal, and anthracite; that is to say, in the formation of oxygenated fixed carbon compounds very different from petroleum. If these "coals" had been distilled it might be argued that "petroleum" were thus formed, but it is, of course, well known that as a general rule they have not been distilled; the necessary heat to bring about distillation was never attained in the unaltered sedimentary strata. At any rate, it is a matter of geological record that the "coals" are found everywhere in the sediments in the undistilled state and not as coke, and that coal and petroleum deposits have no genetic connection of any sort one with the other.

It is equally a matter of geological record that the soft tissues of animal organic matter were not finally entombed in the sediments, where they have left absolutely no trace of their former existence, as demonstrated by the billions of fossils in our paleontological museums and collections, and in the impervious rocks everywhere, without the slightest trace of any carbon compound to be found in them. The former animal organic matter of what is to-day the fossil animal world evidently decomposed fully, or otherwise disappeared entirely, before the final entombment of the hard part of the animal; and therefore no petroleum could possibly be formed from it.

It is insufficient to argue, against such evidence to the contrary, that petroleum must have an organic derivation, because the large petroleum deposits are always found "associated" with sedimentary strata and fossiliferous rocks. This word "associated" is very vague. It takes more than the presence of water in a cave or in a porous rock to prove that that water originated there. Are not volcanic rocks themselves thus "associated" with sedimentary strata—often in successive horizontal flows or laccolitic intrusions interbedded with sediments, or in veins and masses cutting across sediments? Are not the solid petroleum thus found in irregular veins or masses cutting across the sediments? Are not the liquid or gaseous petroleum deposits themselves local and irregular impregnated spots of the porous sediments, not at all in sheets like coal beds? In some districts



(petroliferous provinces) they occur in many sands throughout all the sequence of the sediments from the earliest Cambrian to the latest Quaternary, entirely irrespective of the fossiliferous beds, and mostly in sharp sands without fossils—sometimes above great thicknesses of shale strata, sometimes below all shales, as, for instance, the petroleum in the Trenton limestone of Ohio and Indiana, while in other districts the same entire series of sediments is absolutely barren of petroleum.

It is also insufficient to say that because volcanic rocks are not everywhere to be seen in the petroliferous districts a solfataric volcanic origin cannot be attributed to the petroleum. As I have already quoted several times in other papers, De Launay in his *Science of Geology* remarks:

"The dislocations of the earth are more and more observed to have taken place not alone in mountainous regions but even in regions of plains."

"All the regions of the earth, probably without exceptions, have been subjected to dynamic movements to which are connected igneous manifestations of internal origin."

These disturbances furnished the necessary fissuring of certain belts of strata, whether much disturbed and uplifted, as in California, Roumania, and Galicia, or sometimes lying still comparatively flat and apparently undisturbed, as along the Appalachian belt in Pennsylvania and West Virginia. In all cases, however, the imperviousness of the bulk of the strata, especially the shales, and the fact that these readily caved in and sealed the fissures, prevented the petroleum from entirely escaping to the surface. Through this fissuring of the strata the pent-up solfataric hydrocarbon emanations came up from the interior, losing some of their pressure as they forced their way up through the fine minute fissuring and the imperfectly porous sands. Hence the differences of pressures recorded in the different sands of the same field and the higher pressures recorded in all fields as the petroleum is found in deeper and deeper sands. Hence the fact that in every field or district, not one but a number of different sands belonging to a number of different geological formations, sometimes unconformable, are impregnated with the petroleum in irregular spots, here and there, along the structural lines in the neighboring districts are absolutely barren.

The distribution of the Mexican and of the Texas and Louisiana oil fields along lines of fault has already been referred to, as well as the evident connection of the oil of these fields with vulcanism.

Similarly the oil fields of California belong to much disturbed and fractured belts bordering the Coast Range on each side for many miles. There also the migratory ascent of the hydrocarbons through faults and fissures is most plainly attested by numerous asphalt veins, and by tar and gas springs. That these faults and disturbances, constantly referred to in the reports of Arnold and Anderson, have brought up the hydrocarbon emanations from below the crystalline gneisses and granite is evidenced by the fact that in Placerita canyon, 5 miles east of Newhall, Los Angeles county, a very light oil (between 50° and 60° B.) is produced from crystalline gneisses which overlie the San Gabriel granite. Above these crystalline rocks, the oil is found in California to be stored in the porous reservoir-rocks, or in the seams and joints of any and all the strata affected by these profound disturbances in a geological column of some 26,000 ft. of Cretaceous, Tertiary, Fernando, and Quaternary sediments,

those of each period lying unconformably on the next lower, and the lowest unconformably on the crystalline rocks. It cannot be imagined that the petroleum contained in any one of these rock series can have originated from organic remains in the underlying unconformable series, since they would have been lost at the surface, if they had migrated at all, during the long intervals marked by the unconformities, unless a still more improbable process be imagined; namely, that in each case the organic remains accommodately waited until the end of the long period marked by the unconformity, before beginning to be decomposed and transformed into petroleum, and to migrate upward. There is only one possible explanation: solfataric volcanic emanations of hydrocarbons coming up from below the crystalline rocks along the fault lines and in the zones of disturbance, at repeated periods of dynamic movements of the Coast Range. Some of these movements must have been very recent to explain the oil in the gravels of the Quaternary and the large seepages often found at the surface.

If the other oil districts of America are considered broadly it will be seen that the Appalachian fields, the Northwestern Ohio and Western Ontario fields, the Illinois fields and some of the Indiana fields, and the Mid-Continent fields, all show linear distribution of their petroleum deposits more or less parallel to the Appalachian uplift, except some of the Oklahoma pools, which follow the direction of the Arbuckle or Wichita Mountain uplifts. Along these oil belts the numerous petroleum-bearing rocks do not represent fixed geological horizons—the oil and gas rising from various beds of different ages; and outside of these oil belts, structurally favorable folds are barren of petroleum in the same geological horizons.

Following the Appalachian oil belts, for instance, from Tennessee and West Virginia through Pennsylvania to New York State, the petroleum is found in lower and lower rocks in the geological scale, until they are found right on the top of the Archaean in the Potsdam sandstone. The Archaean, therefore, or the igneous magma below it, must be the final source. It would be puerile indeed to assume one hundred different sources of this belt, since it must then be assumed also that every member of the sedimentary series separating two oil-bearing sands is the impervious cover, and cannot therefore be considered as the source, of the petroleum in the sand below; and since it has to be admitted, after all, that the Archaean rocks, or the igneous magma below the Potsdam, is one at least of the sources.

This peculiar occurrence of the petroleum deposits in the sedimentary strata of all ages, yet in certain districts only, along zones of tectonic structural disturbances of these strata, where they align themselves in "petroliferous provinces," as do the metals in "metallagenetic provinces," is exemplified not only in North America but all over the earth. In Russia the petroleum deposits follow the Caucasus uplift from the Tamansk peninsula in the northwest to the Apcheron peninsula in the southeast for a distance of 750 miles. In Galicia and Roumania they follow the Carpathian range and turn with it in a grand sweep of more than 500 miles from a northwest to southeast direction in Galicia to an east-and-west one in Roumania. The same association of naphtha to a dislocated zone along the Krudestan chain in Persia, has been well described by J. de Morgan. The Tertiary tectonic and igneous "girdles" around the Pacific and the Caribbean sea are followed by an immense Tertiary "petroliferous province," of which the oil fields of California, Alaska,



Japan, Borneo, Sumatra, Java, New Zealand, Peru, Colombia, Venezuela, Trinidad, Mexico, and Texas are salient points.

The constant recurrence of hydrocarbons in volcanic and igneous rocks, volcanic emanations, metallic and other veins, meteorites, comets and other stellar bodies, clearly demonstrates that petroleum is inorganic. The hydrocarbon emanations sometimes follow closely the volcanic lava, as in the Mexican and other oil fields, but they need not be, and often are not, accompanied to the surface by volcanic rocks. They must, notwithstanding, everywhere be held to be of a solfataric volcanic nature, as shown by their peculiar position along the tectonic structural disturbances, and because, moreover, they could not originate in the mass of the impervious sediments, and could only travel through these by means of faults or fissures from deep sources. Besides, with their associated salt and sulphur they are identical with solfataric volcanic vapors emanating from all the volcanic districts of the earth, and are absolutely unlike anything else in nature known to be in the active process of formation at the present time. Like volcanic vapors these hydrocarbons are always found under high pressures, often giving rise to violent explosions and sudden outbursts in enormous quantities, after earthquake shocks, and along disturbed dynamic lines; and, like volcanic vapor, they are also found at times to be still hot and associated with hot waters.

#### RESUSCITATION FROM MINE GASES AND SHOCK

The U. S. Bureau of Mines as the result of careful investigation recommends the following procedure in rendering first aid to those in need of artificial respiration:

In case of gassing, remove the victim at once from gaseous atmosphere. Carry him quickly to fresh air and immediately give manual artificial respiration. Do not stop to loosen clothing. Every moment of delay is serious.

In case of electric shock, break electric current instantly. Free the patient from the current with a single quick motion, using any dry non-conductor, such as clothing, rope or board, to move patient or wire. Beware of using any metal or moist material. Mean-time have every effort made to shut off current.

Attend instantly to the victim's breathing. If the victim is not breathing, he should be given manual artificial respiration at once.

If the patient is breathing slowly and regularly, do not give artificial respiration, but let nature restore breathing unaided.

In gas cases, give oxygen. If the patient has been gassed, give him pure oxygen, with manual artificial respiration.

The oxygen may be given through a breathing bag from a cylinder having a reducing valve, with connecting tubes and face mask, and with an inspiratory and an expiratory valve, of which the latter communicates directly with the atmosphere.

No mechanical artificial resuscitating device should be used unless one operated by hand that has no suction effect on the lungs.

Use the Schaefer or prone pressure method of artificial respiration. Begin at once. A moment's delay is serious.

Continue the artificial respiration. If necessary, continue two hours or longer without interruption until natural breathing is restored. If natural breathing

stops after being restored use artificial respiration again.

Do not give the patient any liquid by mouth until he is fully conscious.

Give him fresh air, but keep his body warm.

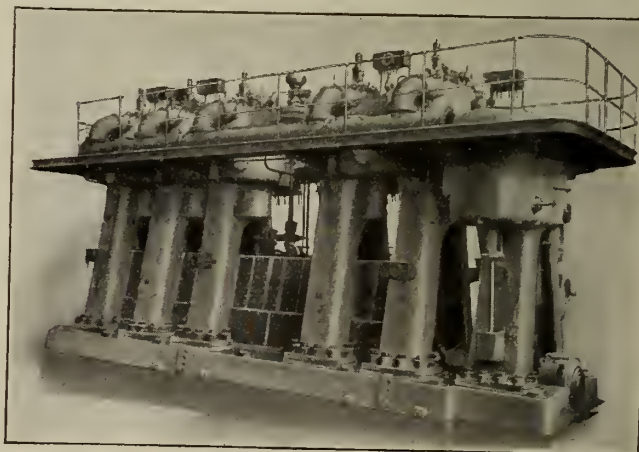
Send for the nearest doctor as soon as accident is discovered.

#### GALICIAN OILFIELDS.

At the time of the outbreak of war, the daily output of the Boryslaw-Tustanowice field in Galicia is stated to have been about 3,000 tons daily, and it is now estimated that the present production cannot be more than 50 per cent. of that amount. Of the men operating in the field, about 60 per cent. were liable for active service, but only about half of these, says the Petroleum World, have been called up, as the Austrian Government wishes to maintain a constant supply of oil for the needs of the railway transport service, the Austro-Hungarian Government and the German Navy. It is pointed out an advance of the Russians from the eastward past Lemberg would very probably cut off the principal Galician field of Boryslaw-Tustanowice from being a source of oil supply to the Austrian and German Governments. Germany imports at the rate of 1,200,000 tons of oil per annum, and, considering that all the sources of supply, except Austria, are closed to Germany, it will be realized how important it is to the latter country that Austria should be able to transport oil and products across the Austro-German frontier.

#### FIRST LARGE DIESEL ENGINE FOR UNITED STATES.

The accompanying photograph illustrates one of two 1,250 h.p. (sea level) Carels type Diesel engines, built for Phelps-Dodge & Co., for the central power plant of the Burro Mountain Copper Co., Tyrone, New Mexico. The plant is situated at an elevation of 6,700 feet, at which height the normal power developed will be



1,000 h.p. Each engine is direct connected to an 815 K.V.A.G.E. 60 cycle, three phase alternator. One engine is now ready for operation, the other practically erected in the power plant.

These are the first large Diesel engines to be installed in America. They are the Carels type, two cycle engines, with five power cylinders. At the right is the scavenging air cylinder, driven directly from the main crank shaft.

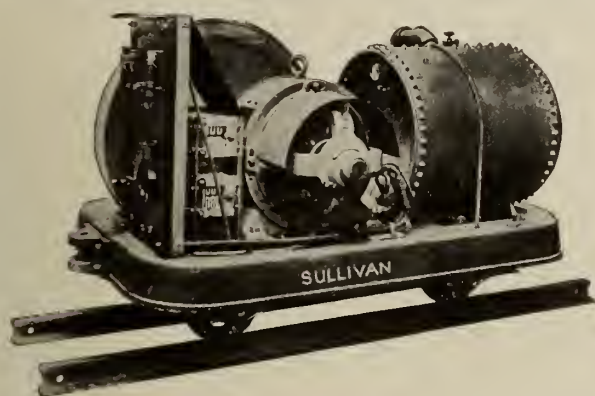
These engines were built by Usines Carels Freres, of Ghent, Belgium.



**A PORTABLE MOTOR OPERATED COMPRESSOR.**

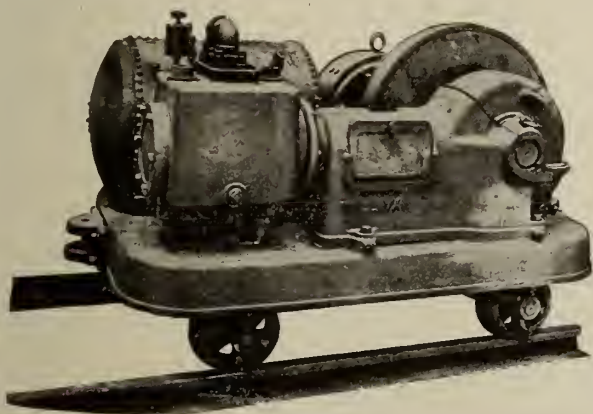
The small motor driven air compressor illustrated herewith is exceedingly useful in mines, industrial plants, etc., for supplying air for rock drills, hammer drills, pneumatic tools, coal pick machines and post punchers.

The complete unit is mounted on a truck of any desired wheel gauge and comprises a 15 h.p. Westinghouse electric motor, the air compressor, a storage tank and a motor starting rheostat.



The motor is of the damp proof type and will operate successfully in the wettest portions of the mine. It is supplied for either alternating or direct current.

The receiver is made of plate steel and is tested to withstand 100 pounds air pressure. With it are furnished a pop safety valve, pressure gauge, and blow off or drain cock.



The construction of the air compressor is very substantial. The bearings are all adjustable and removable. The cylinder is lubricated by a light feed air cylinder lubricator and the crank shaft and crosshead by the splash system. An unloading device on the air inlet valves saves energy when the demand for air is less than the output of the machine.

This compressor is manufactured by the Sullivan Machinery Co., Chicago.

**PERSONAL AND GENERAL**

Mr. B. B. Hood, formerly mill superintendent at the Moose Mountain mine, is now at Chrome, New Jersey.

The Pittsburg meeting of the American Institute of Mining Engineers will be held at the Hotel Schenley, October 8; 9 and 10, 1914.

Mr. H. C. Hoover has accepted the temporary chairmanship of Camp Bird, Ltd., and the Santa Gertrudis Co. Mr. R. J. Frecheville has resigned his position as director of the companies and assumes the chairmanship of the technical committee. Messrs. F. A. Govett

and F. H. Hamilton have joined the boards of both companies, and Messrs. Norman Craig and George de Pass have joined the Santa Gertrudis and Camp Bird boards, respectively.

Mr. Geo. P. Schubert has been appointed assistant professor of mining and civil engineering at the Michigan College of Mines.

Mr. Morton Webber is at Porcupine examining the McIntyre mine.

The Sixth International Congress of Mining, Metallurgy and Geology, to have been held in London, July, 1915, has been indefinitely postponed.

Professor E. S. Moore, M.A., Ph.D., professor of geology and mineralogy at the Pennsylvania State College, is on a visit to Australia.

Mr. T. Walter Beam has returned to Denver, Colorado, after having been at Hedley, Similkameen, B.C., for some time, supervising exploration with the diamond drill of mining property situated near Hedley and held by the New York Syndicate No. 2, which includes leading shareholders in the Hedley Gold Mining Co.

Mr. W. M. Brewer, of Victoria, B.C., after having investigated mining conditions in Skeena district, visited Graham island of the Queen Charlotte group. He will report to the British Columbia Department of Mines on both parts of the Province, in which he has been engaged for several months.

Mr. Frederick K. Brunton, for about two years assistant superintendent at the British Columbia Copper Co.'s smelting works at Greenwood, Boundary district, recently left that place for Anaconda, Montana. He is a son of Mr. D. W. Brunton, of Denver, Colorado.

Mr. George A. Clothier, for some time superintendent of the mining property of the Indian Mines, Ltd., in Portland Canal mining division, British Columbia, is now engaged, with a brother, in operating under lease a silver-lead mine near Hazelton, Omineca mining division.

Mr. Newton W. Emmens, of Vancouver, has returned to the Coast after having spent the summer in the neighborhood of Fish river and the adjacent Lardeau country, obtaining information for a report to the British Columbia Department of Mines.

Capt. A. Fournier, of Kaslo, B.C., until recently manager for the French company that owned the Cork mine and concentrating mill on the south fork of Kaslo creek, has left British Columbia for France, to rejoin his regiment and take part in the European war.

Mr. Fletcher T. Hamshaw, formerly manager for the Pittsburg-British Gold Co., operating a placer gold mine on McKee creek, Atlin, B.C., has this season been working about one hundred men on the James claims on Bonanza creek and Little Eldorado, in the Chisana (Shushanna) gold field, Alaska.

Mr. F. August Heinze has been in British Columbia several weeks. He is interested in mineral claims in Franklin camp, Boundary district, and in a large area of land which is part of the grant made by the British Columbia Government some years ago to the Columbia & Western Railway, from Trail westward through the Boundary country.

Mr. Frederic Keffer is back in Greenwood, B.C., after having been at Clifton Springs, New York, and other places in the United States.

Lieut.-Col. R. G. Edwards Leckie, of Vancouver, B.C., accompanied one of the volunteer regiments of that city to Valcartier, Quebec, en route to Europe to take part in the war on the Continent.



Mr. Lionel E. Hill, superintendent of the Le Roi No. 2 Co.'s Josie group of mines, returned to Rossland, British Columbia, about the middle of September after having been away on a visit to Japan. He has since proceeded to Valcartier, Quebec, to join the engineers who form part of the Canadian contingent going to the European war. Before leaving Rossland he was entertained by local friends and presented with a small souvenir in the shape of a gold-handled pocket knife engraved with his initials and the words, "From the Rossland Mess."

Mr. M. E. Purcell, of Rossland, superintendent of the Consolidated Mining and Smelting Co.'s Centre Star group of mines, is actively promoting the St. John Ambulance Association first aid movement among metal miners.

Hon. Wm. Templeman, formerly Dominion Minister of Mines, has been ill in one of the hospitals in Victoria, B.C.

Major J. E. Leckie, one of several mining engineers who have enlisted for service abroad, was injured at Valcartier camp by being thrown from his horse when it slipped in the mud. It is reported that the injuries are not of a serious nature.

#### OBITUARY.

Henry Bratnober, who died at Livermore, California, on September 12, was some years ago considerably interested in the Le Roi Mining Co., of Rossland, B.C.

#### CANADIAN GENERAL ELECTRIC CO.'S CORPS.

The accompanying photograph shows the corps of engineers raised by the Canadian General Electric Co. for service during the war. The corps has been recruited from the several staffs, and will be maintained by the company until the war is over. This action is worthy of much praise.



The members are: Capt. Ritchie, A. T. McLean, W. S. Johnson, J. S. Dunlop, G. Hillier, C. Henry, George Monaghan, A. Hardie, J. C. Munro, C. C. Rous, P. Foster, E. Crockford, H. S. McKean, A. J. Palmer, R. W. Nurse, H. Galvin, R. Bethune, H. Bestard, H. S. Elliott, Charles Stewart, W. J. Swanger, F. G. Jackson, H. Williams, E. S. Shill, C. Pink.

#### IN INDIA.

Germany made the same mistake about India as it did about Ireland, and everybody who counts on India to be false to Britain will come a cropper."

In these words his Highness the Aga Khan, the recognized temporal leader over sixty millions of Indian Mohammedans, summed up the Indian Empire's status in the world's war.

The Khan has offered to place his personal services and resources at the disposal of the Government, and has volunteered to serve himself as a private in any regiment of infantry in the Indian expeditionary force.

#### LA ROSE.

Montreal, Sept. 22.

At the meeting of the La Rose board recently, when the regular dividend of 2 per cent. was declared, the directors listened to a lengthy report from Manager Watson, who also read a report by Manager Robbins of the Hollinger mine, on the future possibilities of profitable operations. Both reports advised that extensive explorations and development be carried on.

For some time there have been rumors that the La Rose would suspend operations and disperse the surplus held in the treasury, but it was stated by one of the directors that it was now most likely operations would be continued and further extensive development work done. When the dividend checks are mailed a copy of the reports will accompany them, which will explain fully the position at the mine and the course of action thought best by the directorate.

The present unsettled condition of the silver market has not as yet affected the work at the mine. Everything is going along as usual, and just as soon as enough silver is mined to warrant a shipment being made, it will be sent to London to be held for spot sale.

It is stated that the dividend just declared was not earned, but is being paid out of surplus.

#### THE ARCHEAN GEOLOGY OF RAINY LAKE.

The Geological Survey has published a report by Dr. A. C. Lawson on the Rainy Lake region. In the eighties Dr. Lawson, then a young geologist on the staff of the Geological Survey, was engaged in a reconnaissance in this region, and his reports on the

district became classical. At that time the district was difficult of access and covered with primeval forest, so that geological work was carried on under great difficulties, and only a reconnaissance was possible. In the interval of time that has elapsed, a vast amount of detailed work has been carried on by the United States Geological Survey and the various state surveys to the south of the International Boundary line that has added largely to the knowledge of the Pre-Cambrian. It was felt that it would be of great interest and value to have Dr. Lawson revisit his old field, and study it under the more favorable condition now prevailing.

The principal object is to present Dr. Lawson's position and his mature opinions based on his re-examination and more detailed study of the district.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA

With the exception of the Boundary district, where there does not appear to be any prospect of an early resumption of copper mining and smelting operations, the outlook for metalliferous mining in the Province is somewhat brighter, though there does not seem to be much change so far as concerns interior coal mines. Ore receipts at Trail show a fairly high total for the last fortnight, namely 16,574 tons, of which, however, the greater part—12,130 tons—was from Rossland mines. East Kootenay's proportion was 2,362 tons, nearly all of lead ore from the Consolidated Co.'s Sullivan group mine. Production in Ainsworth, Slocan and Nelson divisions is much decreased, yet a larger number of mines is being operated, chiefly doing development work, than might have been expected under present unfavorable conditions.

News from the Cariboo placer-gold field is generally satisfactory, a cool and rainy summer having kept up a good supply of water for hydraulicking purposes, with resultant benefit to the mine operators of that district. Similarly, satisfactory news has come from the Atlin gold field, where there continues to be much activity on a number of gold bearing streams.

Little news is available concerning what is being done at the copper mines of the Britannia, Granby Consolidated and Tacoma Steel Co., the last-mentioned being owner of the Marble Bay mine on Texada island, but all are being worked. The development of ore at considerable depth in the mine of the Portland Canal Tunnels, Ltd., near Stewart, Portland Canal, is regarded as promising to be of much importance. If present indications of the occurrence of ore in commercial quantity be borne out by later developments, there may be expected to come about, as soon as industrial matters resume their normal condition, a marked change in that camp, since much more deep-level development will, no doubt, be undertaken.

Statistics of gold bullion receipts at the Dominion Assay Office, Vancouver, show a decided increase for the current fiscal year as compared with those for the corresponding months of 1913. For the month of August, 1914, approximate, the figures are 22,500 oz. of bullion, valued at \$311,000, as compared with 12,000 oz., valued at \$161,000, for August, 1913. For the expired five months—April-August—of the present fiscal year, the totals are 103,000 oz., valued at \$1,385,000, against 35,700 oz., valued at \$529,300, for the corresponding period of 1913.

#### West Kootenay.

**Ainsworth.**—During the two weeks ended September 10, ore receipts at Trail from Ainsworth mines were smaller than in August. They were 232 tons from the Bluebell, 152 tons from the Maestro, and 38 tons from the Utica. Neither the Highland nor the No. 1 mine appeared on the list during the first part of the month.

**Slocan.**—On the whole, there is an improvement in mining conditions in the Slocan mining division. The Rambler-Cariboo mine and mill did not long remain inoperative. Both are again active, and shipment of ore has been resumed, though only on a small scale. Announcement has been made that the Wonderful has been leased. In the Cody neighborhood, both the Surprise and Noble Five are being worked, though neither is sending out ore. Several lessees are working in the Reco, where there is reported to be another good showing of ore opened. A little high grade silver ore is being brought out from the Mountain Con, which is

situated at a high elevation and in the mountains beyond Cody. The lessees of the Idaho-Alamo property are getting ore ready for shipment whenever conditions shall admit of its being sent out.

In Silverton camp, the Standard is giving employment to a number of men who are doing deadwork, but no ore is being stoped nor is the concentrating mill running. A quantity of zinc concentrate that had accumulated is being sent to a zinc smeltery in the United States. The Silverton Mines, Ltd., is operating both mine and concentrating mill, the former comprising the Hewitt-Lorna Doone group.

**Nelson.**—Ore from the Molly Gibson mine, in this division, has been arriving at Trail; in August 158 tons was received, and during the week ended Sept. 10, 147 tons. Work is being done on the Pingree property, on Forty-nine creek, distant from Nelson about a dozen miles. Mr. F. E. Pearce is now superintendent here, and he has opened some promising showings of ore.

In the Sheep Creek and Salmo parts of the district shipment of lead ore has been stopped for the time being. The Queen gold mine and 20 stamp mill have not been affected by the generally unfavorable conditions, for these are being continued in operation. A recently published report is to the effect that a shortage of water for power purposes has necessitated closing for a while the Motherlode Sheep Creek Mining Co.'s gold-saving mill.

#### Boundary and Similkameen.

The last report published of the Jewel gold mine, in Long Lake camp, eight miles from Greenwood, was to the effect that operations were continuing to be profitable, and that ore was being mined up to the crushing capacity of the 15 stamp mill running there.

The Hedley Gold Mining Co.'s 40 stamp mill at Hedley, Similkameen, is being operated as usual. It is stated that this company, scenting possible trouble ahead, before the European war cut off supplies, purchased sufficient cyanide to meet its needs for a considerable time, so that its progress is not being interfered with by any shortage of mill supplies. The directors declared the customary dividend of three per cent. and bonus of two per cent., the total of profit thus distributed on September 30 having been \$60,000.

#### Coast.

The collection of British Columbia minerals that has been made by officials of the Canadian Government Exhibition Commission is described as being a very good one—generally representative, and the specimens carefully selected, so that this Province should have as comprehensive a display included in Canada's mineral exhibit at the Panama-Pacific Exposition next year as the Provinces of Quebec and Ontario, which have long been well represented in the Dominion mineral collection for exhibition purposes. Mr. W. D. Dalglish, who is in charge of the mineral section, after having spent several months in British Columbia, is about to proceed to San Francisco, to there prepare for next year's big exposition. Mr. Wm. Thomlinson, who has been very assiduous in his endeavors to secure the best samples of ores and other minerals obtainable in the parts of the Province assigned to his charge as mineral collector, will remain in British Columbia to attend to forwarding to San Francisco all the minerals gathered in the Province for display in California. Both men have been thorough in their work of collecting specimens of minerals, and the result will doubtless eventually be of much advantage to the mining industry of the Province.



**Portland Canal Tunnels, Ltd.**—Supplementary to the information relative to the recent important developments in the deep-level adit that this company has driven, included in the last mining news contributed to the Journal from British Columbia, is the following: On September 4 Mr. W. J. Elmendorf, the company's general manager, telegraphed to the secretary at Victoria that the adit was "twenty-five feet into the green vein and still looking very well. Two feet practically solid ore and four feet mixed ore passed through. All intervening ground well mineralized; probably more ore ahead." On September 5, he telegraphed: "Assays yesterday on galena ore 38 oz. silver. Still in vein with some ore in face." Under date September 8 he wrote that the adit was then in 3,642 ft. Part of his report follows: "The face of the tunnel has never been out of ore since my last letter. I do not mean to give the idea that we have been driving across a vein in a solid ore body, or even that it is all milling ore. Much of it is, however, and several streaks from two to ten inches wide are solid sulphides. The proportion of lead in the ore as we approach the footwall of the vein seems to increase, and I believe that the gold content is bettering also. Our last assays showed on September 6 as under.

	Gold.	Silver.
Average of 1 ft. of ore, half quartz....	\$4.80	8.7 oz.
Picked galena .....	3.20	27.4 oz.
Average 6 in. streak, some waste ....	12.00	14.8 oz.
Average 1 in. streak, iron and zinc..	0.60	2.7 oz.
Muck on Sept. 5. ....	1.20	2.8 oz.

"As the face has been advanced far enough to allow us conveniently to get at the first of the ore we cut, I shall properly sample as much as possible before sending my next letter. I am sending down to you samples of ore from the face of yesterday and to-day. You will see that the samples assayed, as above, were not assayed for lead, but we can see the galena in the ore. Samples 1, 2, and 3 reported to-day would go 8, 75 and 15 per cent. lead, respectively. It is not necessary to actually determine the lead contents unless we are shipping ore. We are not yet across the vein, which is at least 43 ft. wide, but a little slate showing yesterday and to-day indicates that we may be nearing the footwall. Another good seam of ore is showing in the face of the adit as I write. I do not wish anyone to be unduly enthusiastic, but can say in all earnestness that the ore body we have opened, and are still opening, is one of great possibilities, and may make a mine for us here. (Note—Last month the depth was stated to be about 2,000 ft. That was incorrect—it may be only about 1,200 ft.)

## COBALT AND GOWGANDA

Generally conditions have very much improved during the past two weeks. Satisfactory temporary arrangements have been made with the smelters, and the output from the mines and mills shipping ore and concentrates is normal. For a time the passage of the Atlantic was deemed too hazardous for such valuable contraband as silver, but latterly the Admiralty has notified that the passage of the high seas is clear, and the express companies have taken bullion again at slightly over normal risks.

**Kerr Lake** has resumed operations with a full crew of between 150 and 175 men. The Drummond Fraction is also working once more; the Beaver is running its mill, but not working underground. The report that the Casey would again put on full force appears to have been premature.

**Cobalt Lake.**—It is officially stated that the Cobalt Lake Mining Co. will proceed with the draining of the lake. The company had decided after the opening of the war that in view of the financial conditions this important development would have to be laid over until times were more propitious; but recently word has been received from London that the original plans would be adhered to and the draining would commence at once. The Cobalt Town Council notified the company that owing to the fact that there was not sufficient money in the treasury and that it was impossible to sell bonds, the town could not carry out the sewage disposal work rendered necessary by the draining of the lake. The company is understood to be willing to undertake this work and charge it up to the town for payment later.

**Nipissing.**—The production of \$112,905 at the Nipissing last month was made up almost equally of high and low grade ore, \$100,899 being credited to high grade and \$12,066 to low grade.

That no less than 540 ft. of ore has been developed on vein 98 of the Nipissing is shown in the last report. The vein has been completely developed by a drift and raises from that distance. Three raises have shown the ore shoot to have a height of 65 ft. above the level, and a fourth raise gives a height of 80 ft.

While the vein was being prepared for stope timbers a calcite vein which showed no values at the level has been found to contain ore above the level, and developments to date show one to two inches of ore assaying 1,500 oz. to the ton.

A fifth level is being developed at shaft 73. A winze is being sunk on the centre of the main ore shoot until the Keewatin formation is encountered.

At the 90 ft. level of 64 a drift is being run to the east in order to get under the good ore shoot at the 300 ft. level. The drift to the west has been pushed almost to the boundary.

The "Little Silver" development is proving more remunerative than at first anticipated. The vein assays 2,500 oz. over a width of two inches. Some stopping is being done on vein 122.

## NOVA SCOTIA

### Dominion Coal Outputs.

The output of the Dominion Coal Co.'s collieries in the Glace Bay district for the month of September will be in the neighborhood of 350,000 tons, compared with 407,000 tons in September, 1913. The Springhill mines will produce about 35,000 tons against 29,000 tons in September last.

The total production to the end of September compares approximately with last year's figures, as under:

	9 mos. ending Sept., 1913.	9 mos. ending Sept., 1914.
Springhill mines ....	286,000 tons	306,000 tons
Glace Bay mines ....	3,527,000 tons	3,350,000 tons

Total. . . . .	3,318,000 tons	3,656,000 tons
Decrease. . . . .		157,000 tons

Under all the circumstances the decrease in production is less than might reasonably have been anticipated.

The Springhill mines have done particularly well, having increased production by 20,000 tons in the year to date when compared with last year. The workmen at Springhill are to be congratulated on having such steady and continuous employment under the prevailing trade conditions. In this respect the



Springhill mines are at the present time unique among the mainland collieries of Nova Scotia.

**Pit-timber supplies.**—One effect of the war upon the coal mining industry in Great Britain has been to restrict very severely the importation of pit timber into Great Britain. The supply comes chiefly, or almost altogether, from the countries surrounding the Baltic. Trade papers in Great Britain report an increase of 50 per cent. in the price of pit props, and an interesting sequel has been enquiries in Canada for pit-timber supplies, made through the British Trade Commissioner.

So far as Nova Scotia itself is concerned the available pit timber is not more than sufficient for the needs of the local coal mines, but New Brunswick and Quebec should be able to furnish pit props and timber in sufficient quantities.

Apropos of this question it is interesting to note that an investigation is at the present time on foot under the joint auspices of the Dominion Forestry Department and the Mining Faculty of McGill University, having for its object the collection of information regarding the life and use of pit timber in Nova Scotia, and the possible economies through proper selection of timbers and the use of preservatives. Up to now practically nothing has been done in Nova Scotia in the way of treating pit timber as a preventative against decay and decay-causing fungoid growths. Reference has been previously made in this correspondence to the findings of the reconnaissance of survey of Nova Scotia forests, carried out under the direction of Dean Fernow some few years ago, which showed that Nova Scotia was really but poorly provided with valuable timber, and pleaded for some centralized and intelligent system of tree-planting and fire-guards. European enquiries now develop the significant fact that Nova Scotia possesses barely sufficient timber for her own requirements, notwithstanding that large tracts of Nova Scotia are of such a character as to be of no value for any purpose but that of timber raising. The problem is one that will have to be tackled by the Provincial Government, because no single individual or group of individuals can undertake the work hoping for private profit. The length of years needed to produce saleable lumber, or even such small lumber as pit props, from seedlings, is too long for private enterprise. Even large corporations have to pay dividends, and the shareholders of to-day cannot be made to see the advisability of expending present revenue for the prospective benefit of the shareholders of fifty years to come.

### ELECTRICAL EQUIPMENT OF OIL WELLS.

A bulletin issued by Canadian General Electric Co., Limited, describes electrical equipment of a large number of wells and gives tables of actual comparative operating costs for a considerable range of conditions showing excellent results obtained.

A shallow oil find has been reported on the Moses Laforet farm concession 8, Sandwich East township, in Essex County. Laforet drilled through 60 ft. of surface and 50 ft. of rock, first striking gas and then water with a small proportion of oil, about an inch of oil showing on top of a pail of water. John Robinson, a neighbor, struck a small gas flow three years ago, which he is still using for household purposes; but oil was not previously encountered.

### CYANIDE PRODUCTION IN UNITED STATES.

"Before sodium cyanide—the commercial product which is now used in gold and silver mining the world over—was placed on the free list, 90 to 95 per cent. of the consumption in America was supplied by domestic production," says F. W. Braun, of the Braun corporation, who is an authority on the conditions which govern its production and consumption.

"Following the removal of the tariff, the reverse became the case—90 to 95 per cent. has been imported, principally from Germany.

The largest plant, although partially dismantled and operated at about one-tenth of its capacity is still in existence. Before the tariff was removed, the United States produced 16,000,000 to 18,000,000 pounds a year, of which the large plant located at Perth Amboy, N.J., yielded 14,000,000 pounds. The owners will probably find it advisable under present conditions to resume operations, provided they can be assured of some protection in the future against foreign importations.

### GRANBY.

Operations of the Anyox property of Granby continue satisfactory, according to official reports. Many of the difficulties encountered just after starting the smelter have been overcome. Part of the time the full battery of three furnaces has been operating and as the need for alterations arose one of the stacks has been temporarily shut down. The management had counted on the Midas mine in Alaska being in position to start production during mid-summer, but delays in deliveries of material and the unsatisfactory metal market conditions have made this impossible. It is probable, however, that operations on a limited scale will be commenced late in October or early in November.

### THE MANUFACTURE OF COKE IN THE UNITED STATES.

According to Edward W. Parker in a bulletin published by the U. S. Geological Survey the cause of conservation has been as signally and materially advanced during the last few years in the manufacture of coke, through the development of retort-oven practice, as has been evinced in any branch of mining and its collateral industries. The new era in coke making in the United States had its modest beginning in 1893 in the construction at Syracuse, N.Y., of 12 Semet-Solvay by-product retort ovens which were operated in connection with the chemical works of the Solvay Process Co. Progress at first was slow, for among furnace men a strong prejudice existed against the product of the retort oven which lacked certain physical characteristics, particularly the silvery luster and musical "ring" of the beehive coke, to which for many years they had been accustomed. It required a decade for the young rival of beehive coke to establish a firm hold, for, although production increased each year from the time the first plant was constructed, by 1902, the total quantity of retort coke produced was less than 1,400,000 tons, whereas in the same period the production of beehive coke had increased nearly 15,000,000 tons.

The second by-product coking plant to be erected in the United States was one of 60 Otto-Hoffmann (now known as "United-Otto") ovens built for the Cambria Iron Co., at Johnstown, Pa., in 1895, and it was the



enlargement of this plant to 160 ovens in 1899 that probably exercised a considerable influence in convincing furnace men that the luster and ring of beehive coke were not essential qualities in the manufacture of iron.

During the last two or three years the progress in the manufacture of by-product coke has been marked, not only in the number of ovens built and under construction but in the size and capacity of the ovens themselves. The original Semet-Solvay ovens at Syracuse, N.Y., were 30 feet long, 16 inches wide at one end, 17 inches wide at the other, and 5 feet 8 inches high. They had a charging capacity of 4.4 short tons of coal. The original Otto-Hoffmann ovens at Johnstown were 33 ft. 6 in. long, 6 ft. high, and 17 to 21 in. wide, with a charging capacity of 5.5 tons. Many of the retort ovens constructed at the present time are over 36 ft. long and nearly 12 ft. high but without much additional width, and they have a charging capacity of from 12 to 16 tons.

The number of retort ovens in the United States in 1902, the end of the first decade in the era of by-product coke manufacture, was 1,663; in 1912, at the end of the second decade, there were 5,211 such ovens, and in 1913 they numbered 5,688. The increase in the number of retort ovens from 1912 to 1913 was 477, whereas the total number of ovens increased 420, from 102,230 to 102,650. As will be shown later, however, many thousands of the beehive ovens were idle in 1913, more than half of them probably for the whole time, whereas all but 157 of the completed retort ovens were in operation. There were 1,321 new ovens building at the close of 1913, of which 504 were of the by-product type. The output of the by-product ovens in 1913 represented 27.5 per cent. of the total coke production of the United States. In 1912 it represented a little more than 25 per cent., and in 1911 22.1 per cent.

The evolution in coke making is not only in the steady substitution of the retort oven, and its recovery of the valuable contents of the coal other than coke, for the wasteful beehive; it means also the shifting of the coke-making industry from the vicinity of the mines to the centers of manufacture and population, where the gas may be utilized and the other by-products disposed of at a profit. The extent to which this shifting of the coke-making industry has already taken place is evinced by the statistics of production in West Virginia where there are few coke consuming enterprises. From the time the industry was first started in that State the larger part of the product has been shipped to furnaces in other States. The production of coke in West Virginia in 1913 showed an insignificant gain over 1912, and the industry has not only shown no progress during the last 10 years but has materially declined. The quantity of West Virginia coal used in the manufacture of coke, however, has materially increased, but the ovens at which the coal is used are at points in other States, and most of them are of the by-product or retort type. Returns to the U. S. Survey for 1913 show that the quantity of West Virginia coal made into coke outside of the State in that year was 7,546,674 tons, or nearly twice as much as the coal made into coke at ovens within the State. Another evidence of this marked change is that of the 17,826 ovens in West Virginia in 1913, 9,129 were idle the entire year and many others for a portion of the year.

In spite of the progress made in the last few years in the manufacture of coke in by-product ovens the United States is still much behind some European countries in

this regard. In Germany and Belgium the retort oven is the only one used, the beehive having been discarded years ago. One of the reasons for the somewhat tardy development in the United States is peculiar, being nothing less than the well-grounded apprehension as to the early exhaustion of the Connellsville coal. Because of the limited span of life yet remaining to the Connellsville region, the owners and operators in that district have not felt disposed to throw away the capital already invested in the beehive ovens that have made the Connellsville district notorious and the coke famous.

### THE ORIGIN OF COAL.

According to David White and Reinhardt Thiessen in a bulletin published by the U. S. Geological Survey the fact is almost universally accepted that beds of coal represent accumulations of vegetal matter in varying stages of preservation, with, as a rule, very small proportions of the remains of animal life. Mingled with the organic substances are different inorganic mineral sediments, which, together with the mineral matter originally contained in the plants themselves, constitute the "ash" of coal. The examination of coal shows that the kinds of ingredient plants range all the way from algae and fungi to large trees of various orders, and that these in turn vary in their own groups according to the depth and the nature of the water in which they grew and according to the other conditions of growth, such as moisture, temperature, soil, light, climate, and the competition of individuals. The species or kinds of plants and the numbers of each kind also differ greatly among themselves, not only during any one geologic period because of the changes of environment, but also from one geologic period to another, and it will be remembered that well-developed coal has been found in the strata of every period since the Silurian.

Most geologists now agree that coal is transformed peat. True there is wide difference of opinion as to how the transformation has been accomplished and even as to whether coal started as such peat as is now found. Some writers insist that the higher grade coal, in its process of development, never passed through geologic stages of existence as peat, lignite, etc., but these writers are relatively few. At all events there is scarcely anyone who does not admit that some peat has been converted to coal in the normal geologic processes. In the following pages the term "peat" is used in its broad sense, to include lowland swamp and salt-marsh or estuarine peats, as well as inland-bog peats. Ordinary or typical coal beds were formed from plant remains in vast lowland or coastal swamps and deltas.

The plant materials composing coal differ both in kind and in degree of preservation, or, rather, of decomposition, for it will be recalled that all the organisms forming the deposit undergo more or less decay, the extent of which depends on climate, water table, and other conditions of deposition, just as in the peat swamps of the present day. The rate and the extent of the decay are controlled largely by the oxygen supply, which is chiefly affected by the rate of plant growth, temperature, the exposure to the air, the drainage, and so forth. Obviously the growth of the peat accumulation requires that the rate of contribution of the plant material shall, on the whole, exceed the rate of decay, the putrefaction being finally smothered by exclusion of oxygen from the buried debris or stopped by the influence of the toxic products of decay accumulating beneath the surface of the bog.



The process must take place beneath a water cover, preferably stagnant, or in the presence of sufficient moisture to prevent the vegetal matter from forming merely vegetable mold or humus. In some cases all of the tender and delicate structures have disappeared, leaving only the most indestructible debris, such as the grains or lumps of resin left by the completely decayed wood of certain conifers, fragments of hard and resistant cuticles, tough and oily seed coats, and gummy spore envelopes. On the other hand, much of the accumulated material may have decayed relatively little, and the vegetal mass composing the main substance of the coal may consist largely of wood, or, rarely, it may contain tender and delicate tissues of miscellaneous types, including fungi and possibly even algæ.

### NIPISSING.

Nipissing Mines Co. has declared regular quarterly dividend of 5% payable October 20 to stock of record, September 30. Books close September 30 and re-open October 19. This dividend coincides with the payment made three months ago when the extra of 2½% was omitted. At that time property conditions for a time were not up to normal, and it was decided to eliminate the extra payment. That it was a temporary mine condition, however, was demonstrated by an improvement in earnings which almost immediately set in. The company's cash position during the past quarter has improved slightly. The statement follows:—

	Sept. 8.	June 8.
Cash . . . . .	\$730,149	\$865,318
Bullion . . . . .	126,949	250,140
Ore in transit and on hand . . . . .	507,831	210,412
Total . . . . .	\$1,364,929	\$1,325,870

### LOCK GATE LIFTER FOR TRENT CANAL.

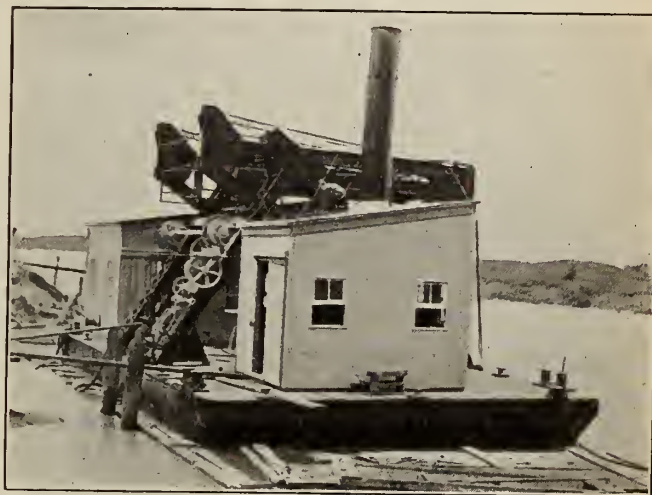
The accompanying illustrations show the steel pontoon lock gate lifter that was recently built for the Department of Railways and Canals, for service on the Trent canal, by M. Beatty & Sons, Ltd., of Wexham. It was designed and built to lift and place into



Gate Lifter with Derrick Raised

position the lock gates, and its capacity of 50 tons and clearance of 37 ft. above the deck, will enable it to step any of the mitred gates throughout the entire length of the Trent canal. It has a structural steel collapsible derrick, mounted on a steel pontoon, with separate steam engines for each operation.

The derrick is built of structural steel in two units. When in working position the derrick is erect as shown in cut No. 1. In transporting the lifter from one lock to another, the upper part of the derrick is lowered



Gate Lifter with Upper Part of Derrick Lowered

where necessary, as per illustration No. 2, which allows of its passage under overhead bridges along the canal. The operation of raising and lowering the derrick is performed by a 6 by 6 double cylinder engine mounted on one of the back legs.

The pontoon is kept on an even keel by two movable ballast cars under deck.

### SETTLEMENT OF COLORADO STRIKE.

Washington, Sept. 15.

President Wilson was notified to-day that the United Mine Workers of America had accepted the tentative basis for the settlement of the Colorado strike submitted by the President last week. The terms accepted by the miners, and also placed before the Colorado operators by President Wilson provide, in brief, as follows:

A three-year truce.

The appointment of a grievance committee by the President.

Open-shop conditions.

Re-employment of strikers not found guilty of crime during the strike.

Withdrawal of the Federal troops.

In a letter to the President, the executive officers of the Mine Workers said their acceptance was, of course, conditioned upon action by the convention of the Colorado branch of the organization now meeting at Trinidad.

The heads of the mine companies involved have notified the President that they are carefully considering the matter.

## MARKETS

## QUOTATIONS, SEPTEMBER 23.

## Cobalts—

	Asked.	Bid.
Bailey . . . . .	$\frac{3}{4}$	$\frac{1}{2}$
Beaver Consolidated . . . . .		20
Buffalo . . . . .		75
C-Fer . . . . .	15	11
City of Cobalt . . . . .		30
Cobalt Lake . . . . .	45	37
Crown Reserve . . . . .	1.15	1.08
Gould . . . . .	1	$\frac{1}{2}$
Great Northern . . . . .	$4\frac{1}{2}$	4
Hargraves . . . . .	2	
Kerr Lake . . . . .		4.25
La Rose . . . . .		78
Nipissing . . . . .	5.50	5.15
Peterson Lake . . . . .	$23\frac{1}{4}$	
Timiskaming . . . . .	9	$8\frac{1}{2}$
Wettlaufer . . . . .		5

## Porcupines—

	Asked.	Bid.
Apex . . . . .	2	$\frac{1}{2}$
Dome Extension . . . . .	$5\frac{1}{4}$	
Gold Reserve . . . . .		1
Hollinger . . . . .	18.00	17.00
Jupiter . . . . .	$4\frac{1}{2}$	
McIntyre . . . . .	$29\frac{3}{4}$	27
Pearl Lake . . . . .	$2\frac{1}{4}$	
Porcupine Cobalt . . . . .	80	
Porcupine V. . . . .	$17\frac{1}{4}$	
P. E. D. . . . .	$1\frac{1}{4}$	$\frac{3}{4}$
Rea M. . . . .		10
Teck-H. . . . .	$7\frac{1}{8}$	7

## TRANSACTIONS, SEPTEMBER 23.

	Open.	High.	Low.	Close.	Sales.
Bailey . . . . .	$\frac{5}{8}$			$\frac{5}{8}$	500
Beaver Consolidated . . . . .	$20\frac{1}{2}$			$20\frac{1}{2}$	500
Dome . . . . .	6.50			6.50	75
Hollinger . . . . .	17.00			17.00	5
Porcupine Vipond . . . . .	17			17	300
Timiskaming . . . . .	$8\frac{1}{2}$			$8\frac{1}{2}$	500

## STANDARD EXCHANGE.

Toronto, Sept. 22.

The Standard Mining Exchange decided yesterday to retain its minimum list, which means that no mining stocks may be offered on the Exchange for a less amount than fixed by the committee when the exchange re-opened on August 24.

The minimum scale fixed by the Exchange, and below which no sales are permitted, is as follows:—

## Cobalts—

Beaver . . . . .	.17
Buffalo . . . . .	.75
Chambers-Ferland . . . . .	.10
Canadian . . . . .	.05
City of Cobalt . . . . .	.30
Cobalt Lake . . . . .	.30
Coniagas . . . . .	6.00
Crown Reserve . . . . .	1.00
Great Northern . . . . .	.04
Hudson Bay . . . . .	30.00
Kerr Lake . . . . .	4.00
La Rose . . . . .	.70
McKinley-Darragh . . . . .	.40
Nipissing . . . . .	4.75
Peterson Lake . . . . .	.23
Seneca Superior . . . . .	2.00

Timiskaming . . . . .	.07
Trethewey . . . . .	.12
Wettlaufer . . . . .	.04 $\frac{1}{2}$
York, Ont. . . . .	.07

## Porcupines—

Dome Extension . . . . .	.05
Dome Lake . . . . .	.30
Dome Mines . . . . .	6.50
Foley O'Brien . . . . .	.20
Hollinger . . . . .	16.00
Homestake M. F. . . . .	.20
Jupiter . . . . .	.04
McIntyre . . . . .	.27
Pearl Lake . . . . .	.02
Porcupine Crown . . . . .	.75
Porcupine Peterson . . . . .	.25
Porcupine Vipond . . . . .	.17
Rea Consolidated . . . . .	.10
Teck Hughes . . . . .	.07
West Dome . . . . .	.05

## TORONTO MARKETS.

Sept. 23.—(Quotations from Canada Metal Co., Toronto)—

Spelter, 6c. per lb.
Lead, 5c. per lb.
Tin, 38c. per lb.
Antimony, 6c. per lb.
Copper, casting, $13\frac{1}{2}$ c. per lb.
Electrolytic, $13\frac{1}{2}$ c. per lb.
Ingot brass, yellow, 10c. per lb.; red, 12c. per lb.

Sept. 23.—Coal—(Quotations from Elias Rogers &amp; Co., Toronto)—

Anthracite, \$7.75 per ton.
Bituminous, lump, \$5.25 per ton.

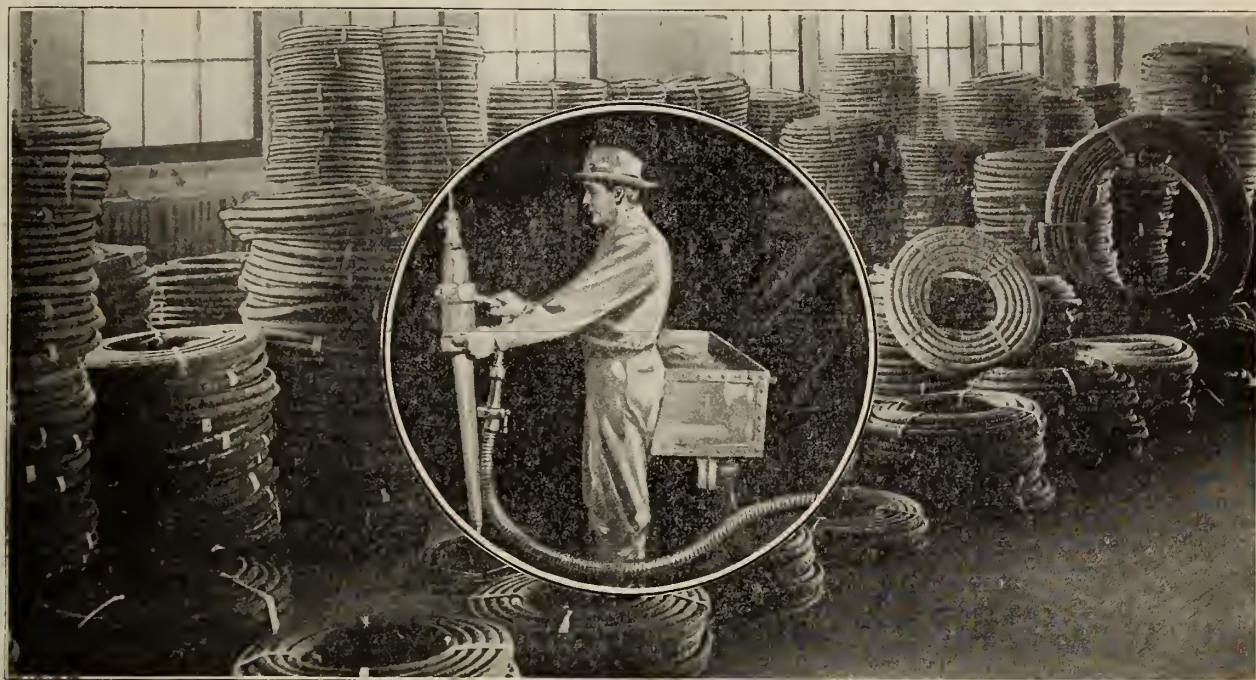
## GENERAL MARKETS.

Sept. 21—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, \$1.70 to \$1.75 per ton.
Foundry coke, prompt, \$2.25 to \$2.35 per ton.
Sept. 21.—Tin, straits, 32.00c.
Copper, Prime Lake, 12.25 to $12.37\frac{1}{2}$ c.
Electrolytic copper, 11.87 $\frac{1}{2}$ to 12.00c.
Copper wire, base, 13.25 to 13.50c.
Lead, 3.80 to 3.90c.
Spelter, 5.30 to 5.40c.
Sheet zinc (f.o.b. smelter), 8.50c.
Antimony, Cookson's, 11.00c.
Aluminum, 18.50 to 19.00c.
Nickel, 40.00 to 45.00c.
Platinum, soft, \$48.00 to \$50.00 per oz.
Platinum, hard, 10%, \$52.00 to \$54.00 per oz.
Bismuth, \$2.75 to \$3.00 per lb.
Quicksilver, \$75.00 per 75-lb. flask.

## SILVER PRICES.

	New York,	London,
	cents.	pence.
September—		
12 . . . . .	55	..
14 . . . . .	$54\frac{1}{8}$	$24\frac{5}{8}$
15 . . . . .	$52\frac{5}{8}$	$23\frac{1}{8}$
16 . . . . .	$53\frac{3}{4}$	$24\frac{1}{4}$
17 . . . . .	$52\frac{5}{8}$	24
18 . . . . .	$51\frac{3}{4}$	$23\frac{1}{8}$
19 . . . . .	$51\frac{1}{2}$	$23\frac{5}{8}$
21 . . . . .	$51\frac{1}{2}$	$23\frac{5}{8}$
22 . . . . .	$52\frac{1}{2}$	$24\frac{1}{8}$
23 . . . . .	53	$24\frac{1}{4}$
24 . . . . .	53	$24\frac{1}{4}$





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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

#### REPORTS RECENTLY ISSUED:

##### **CANADA**

Prospector's Handbook No. 1. Notes on radium-bearing minerals, by Wyatt Malcolm.  
Museum Bulletin No. 2. Contains short scientific papers.

Summary Report of the Geological Survey for the year 1912.

##### **NEW BRUNSWICK and NOVA SCOTIA**

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.  
Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

##### **QUEBEC**

Memoir 22. Preliminary Report on the Serpentine and Associated Rocks of Southern Quebec, by John A. Dresser.  
Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.

##### **ONTARIO**

Memoir 40. The Archæan Geology of Rainy Lake Re-studied, by Andrew C. Lawson.

##### **NORTH-WEST PROVINCES**

Memoir 47. Clay and Shale Deposits of the Western Provinces, Part 3, by Heinrich Ries.  
Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

##### **BRITISH COLUMBIA**

Memoir 19. Mother Lode and Sunset Mines, Boundary District, B.C., by O. E. LeRoy.  
Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.

##### **YUKON AND NORTH-WEST TERRITORIES**

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

#### MAPS RECENTLY ISSUED:

##### **CANADA**

Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

##### **NEW BRUNSWICK and NOVA SCOTIA**

Map 61A. Tobique, Victoria County, New Brunswick. Topography.  
Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.  
Map 39A. Geological Map of Nova Scotia.

##### **QUEBEC**

Map 95A. Broadback River, Mistassini territory, Quebec. Geology.  
Map 100A. Bell River, Quebec. Geology.

##### **ONTARIO**

Map 124A. Wanapitei (Falconbridge, Street, Awrey, and Parts of Maclellan and Scadding Townships), Sudbury District, Ont. Geology.  
Map 49A. Orillia sheet, Simcoe and Ontario counties, Ontario. Topography.

##### **NORTH-WEST PROVINCES**

Map 55A. Geological map of Alberta, Saskatchewan, and Manitoba.  
Map 96A. Wanipigow, Manigotagan, and Oiseau Rivers, Manitoba. Geology.  
Map 103A. Southfork Coal Area, Old Man River, Alberta. Geology.  
Map 107A. Blairmore, Alberta. Geology.  
Map 119A. Willowbunch Coal Area, Saskatchewan.  
Map 114A. Sheep River, Alberta. Geology.

##### **BRITISH COLUMBIA**

Map 43A. Sooke Sheet, Vancouver Island, British Columbia. Topography.  
Map 97A. Franklin Mining Camp, West Kootenay, B.C., Geology.  
Map 99A. Southern portion of Cranbrook map area, East and West Kootenay, British Columbia. Geology.  
Map 104A. Thompson River Valley, below Kamloops Lake, British Columbia. Geology.  
Map 106A. Groundhog coal field, British Columbia. Geology.

##### **YUKON AND NORTH-WEST TERRITORIES**

Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

**NOTE.**—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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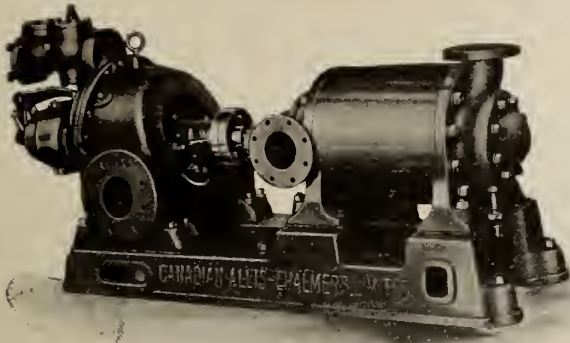
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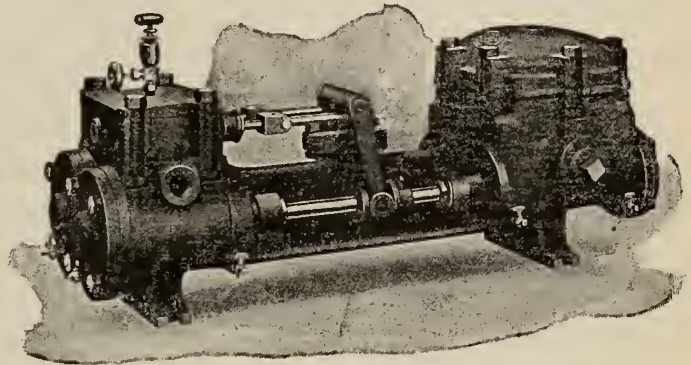


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Minister of Lands, Forests and Mines,

**Toronto, Canada.**



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Ledoux & Co., 99 John St.,  
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Peacock Bros.

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Canadian Allis-Chalmers, Ltd.  
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MANITOBA :	-	-	-	-	-	Winnipeg
ALBERTA :	-	-	-	-	-	Edmonton
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Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 28.)

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Mussens, Ltd.
- Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada),  
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Steam—**  
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Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.
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Pneumatic—**  
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Hoist Co., Ltd.
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Jenckes Machine Co., Ltd.
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Peacock Bros.  
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Northern Canada Supply Co.  
G. Taylor Hardware Co., Ltd.
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Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
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## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$72,194,603; Lode Gold, \$70,859,022; Silver \$33,863,940; Lead, \$27,520,753; Copper, \$73,723,562; Other Metals (Zinc, Iron, etc.), \$1,528,403; Coal and Coke, \$132,871,155; Building Stone, Brick, etc., \$17,576,084; making its Mineral Production to the end of 1912 show an

## Aggregate Value of \$430,137,522

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1892, inclusive, \$81,090,069; for five years 1893-1897, \$31,420,396; for five years 1898-1902, \$77,218,073; for five years 1903-1907, \$109,797,744; for five years 1908-1912, \$130,611,240.

## Production During last ten years, \$240,408,984

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

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*Two thousand square miles of railway lands in the Lake Superior region that have been held in reserve during the construction of the A. C. & H. B. Railway are now open for public prospecting.*

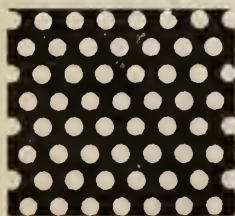
*No license is required; staking, recording and assessment work practically as on Government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. The lands are in alternate blocks with intervening areas of Government lands which are also open for prospecting. Two passenger trains daily through the district.*

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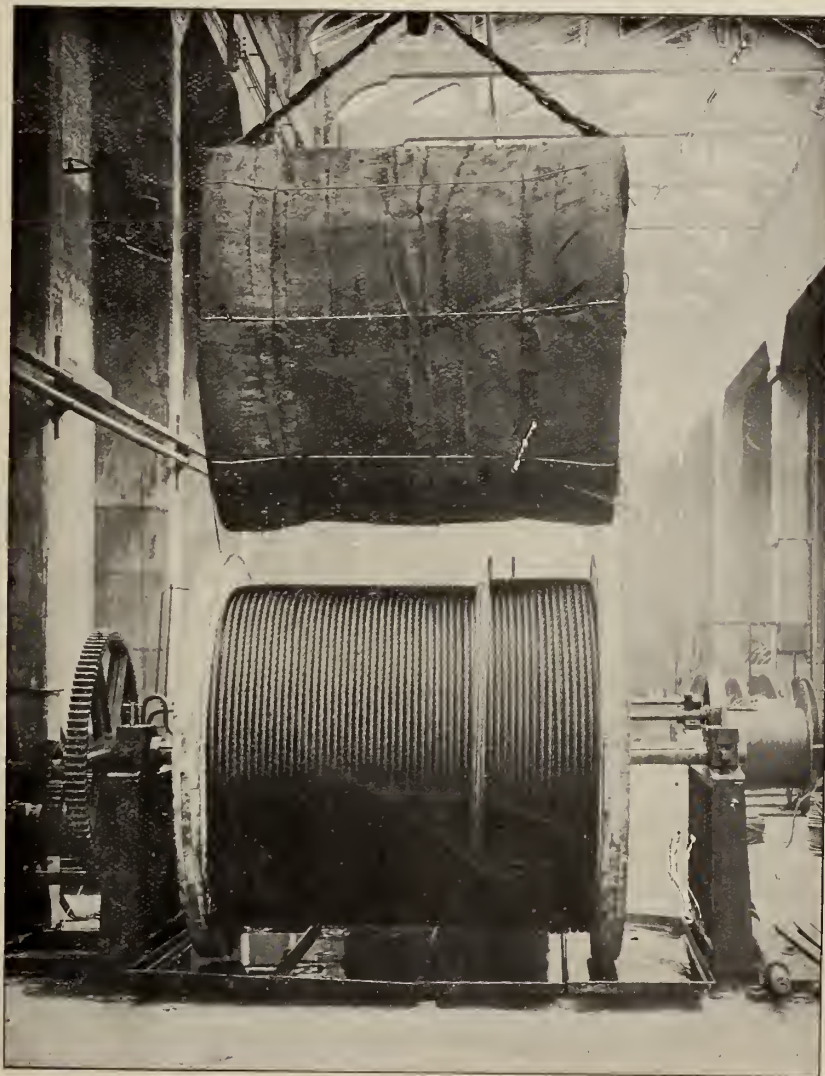
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# ✕ CANADIAN ✕ MINING JOURNAL

VOL. XXXV

TORONTO

No. 20

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7 feet 6 inches in 15 minutes is its latest achievement, against its competitor's 5 feet 10 inches in 18 minutes.

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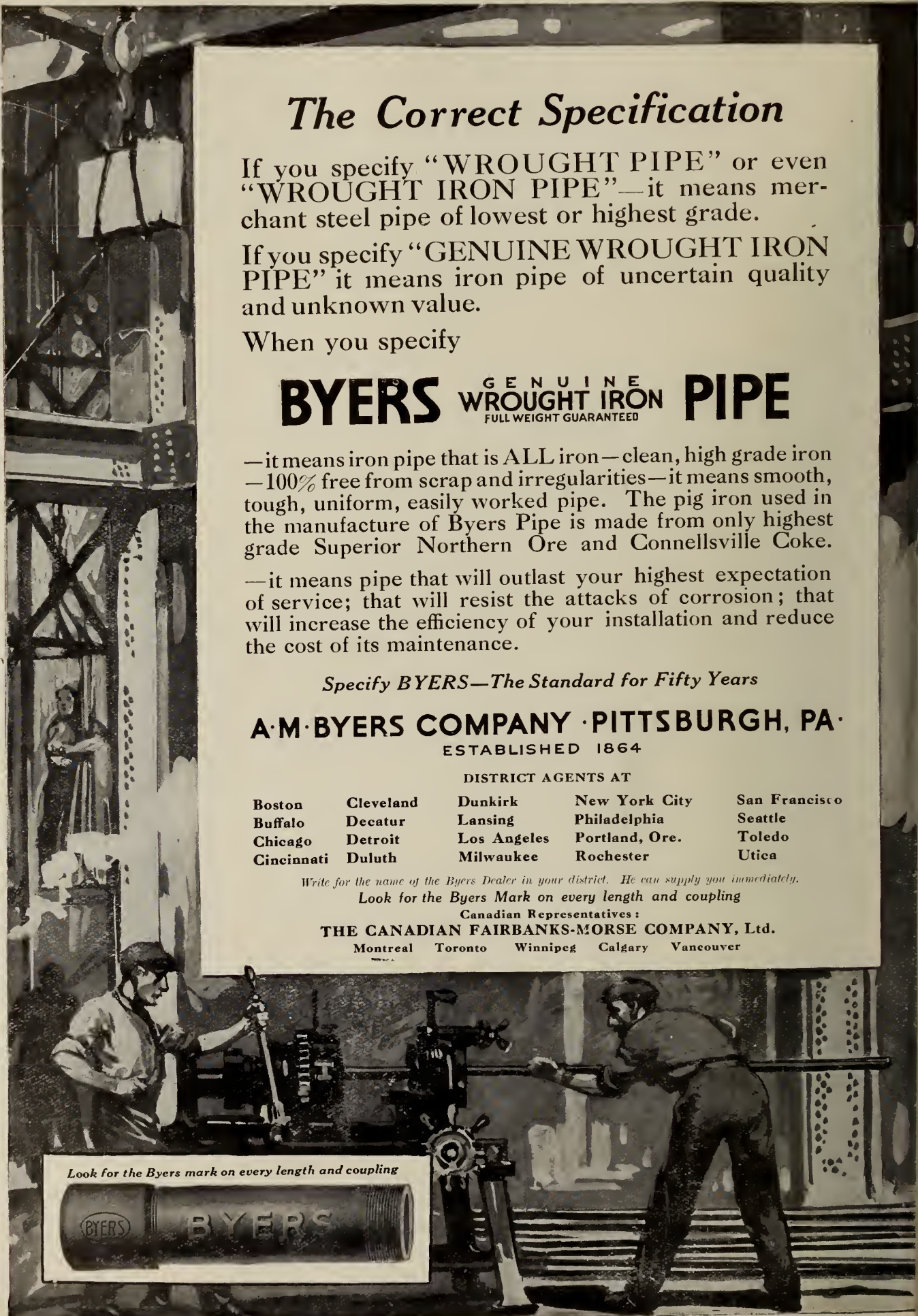
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If you specify "WROUGHT PIPE" or even "WROUGHT IRON PIPE"—it means merchant steel pipe of lowest or highest grade.

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—it means iron pipe that is ALL iron—clean, high grade iron—100% free from scrap and irregularities—it means smooth, tough, uniform, easily worked pipe. The pig iron used in the manufacture of Byers Pipe is made from only highest grade Superior Northern Ore and Connellsville Coke.

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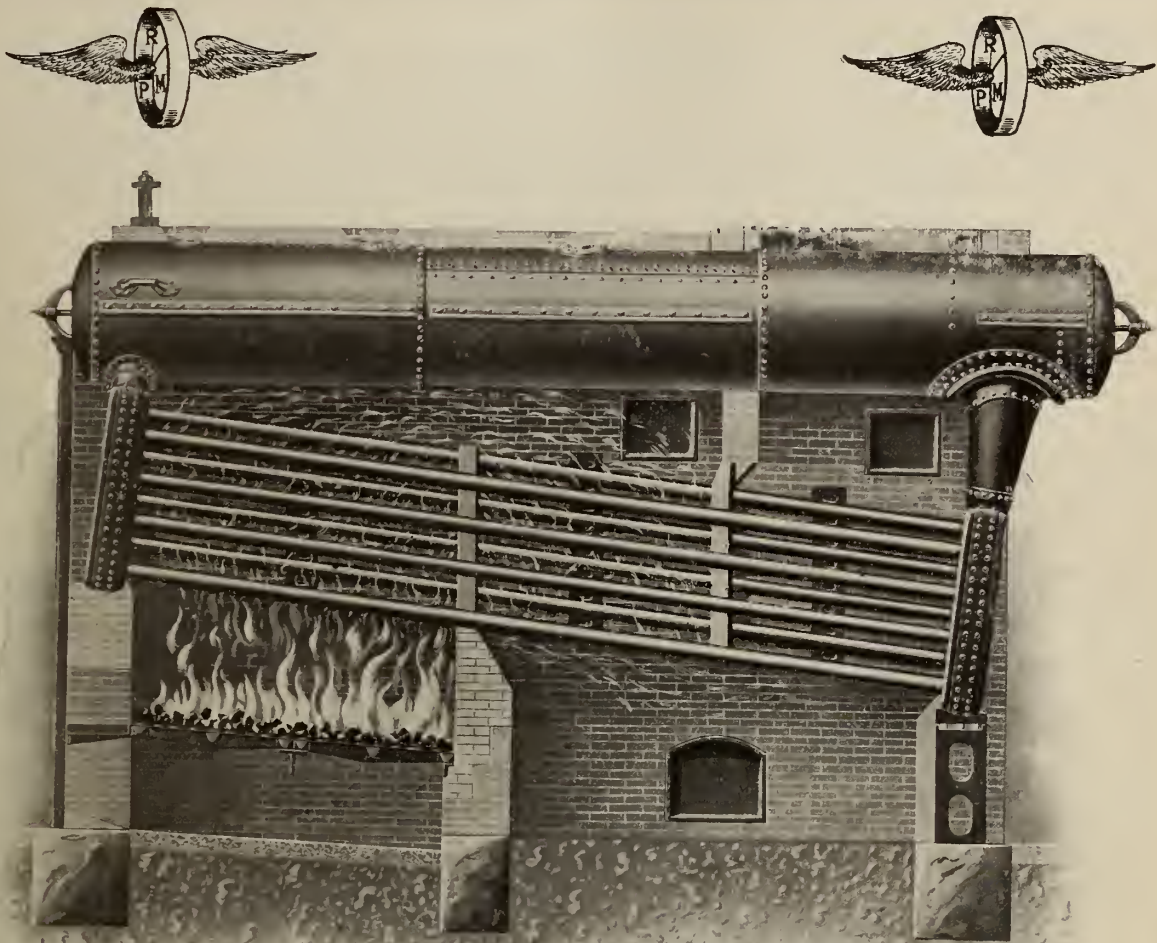
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—and economize time, labor  
and power.

The advantages of these tools for  
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- (1) **Greater Speed** than is gained with tripod drills, because **Air-Jet Sinkers** have no mounting to move, require no set up, and lose no time cranking out steels.
- (2) **Less Labor** is needed since the tool is run by one man and is light and easy to handle.
- (3) **Reduction in Power**, because **Air-Jet Sinkers** use less air than tripod drills.
- (4) **Less Powder** and less waste excavation. Each hole is placed and pointed exactly where it will pull the ground to the best advantage.

Bulletin 666L

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**Sullivan Machinery Co.**

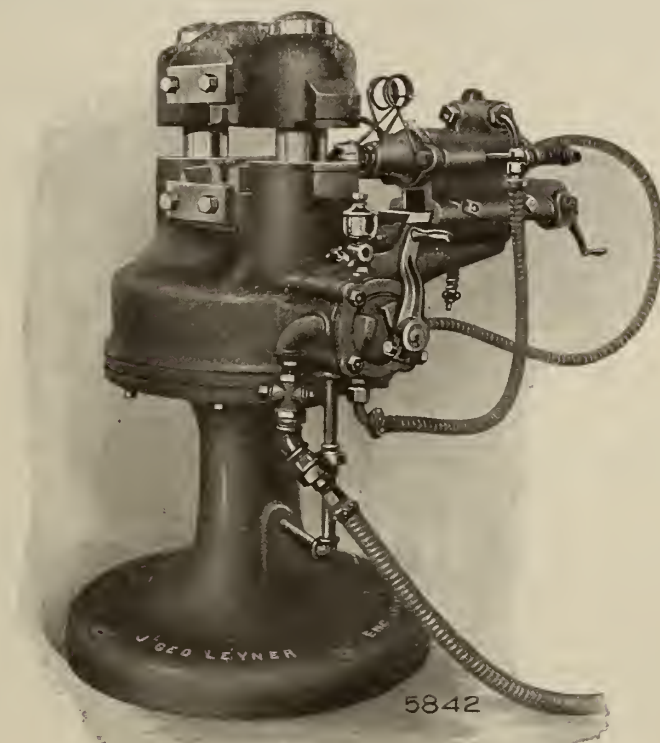
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Sullivan Air-Jet Sinkers at work in a Mine Shaft



# HOW TO MAKE UNIFORM DRILL STEEL BITS CHEAPLY



The I. R. Model No. 5 Leyner Drill Steel Sharpener will make your drill bits cheaper and better than they can be made by hand or by any other mechanical device.

It makes drill steels that are uniform in every respect; can't make them otherwise.

The steel is held in a totally enclosed die and hammered by light rapid blows on a dolly. It is quickly moulded into shape before it has time to cool, and being formed by light blows in one direction only, the natural grain of the steel is not destroyed but is rather improved by the treatment.

The entire operation of the machine is controlled by a single hand lever which is conveniently placed so that the operator can make a complete bit without changing his position. A good operator can make from 20 to 50 new bits an hour, depending upon conditions.

The I. R. Model No. 5 Leyner Sharpener only weighs a ton and only requires a space of 3½ feet square. It is set on a plank foundation; not on stone or concrete.

With an Oil Furnace, for heating steels, it makes an ideal installation under ground and saves trucking and hoisting drill steels.

**THIS MACHINE MAKES SHANKS AS WELL AS MAKES AND RESHARPENS  
DRILL BITS AND MAKES SPIKES, BOLTS AND PINS, ETC.**

*There is some good information in Bulletin 201 besides an illustrated description of this machine.  
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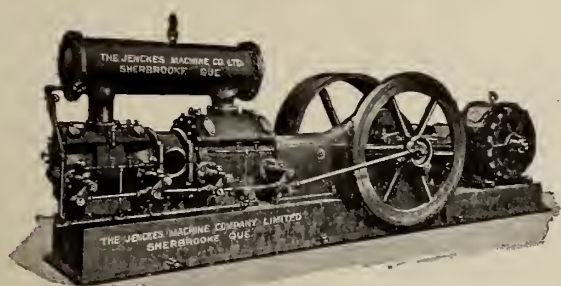
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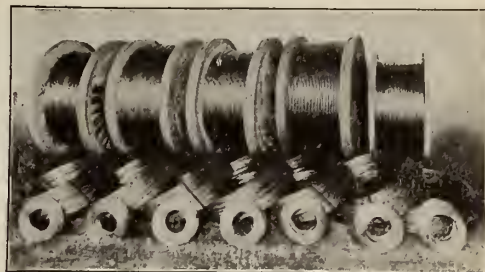
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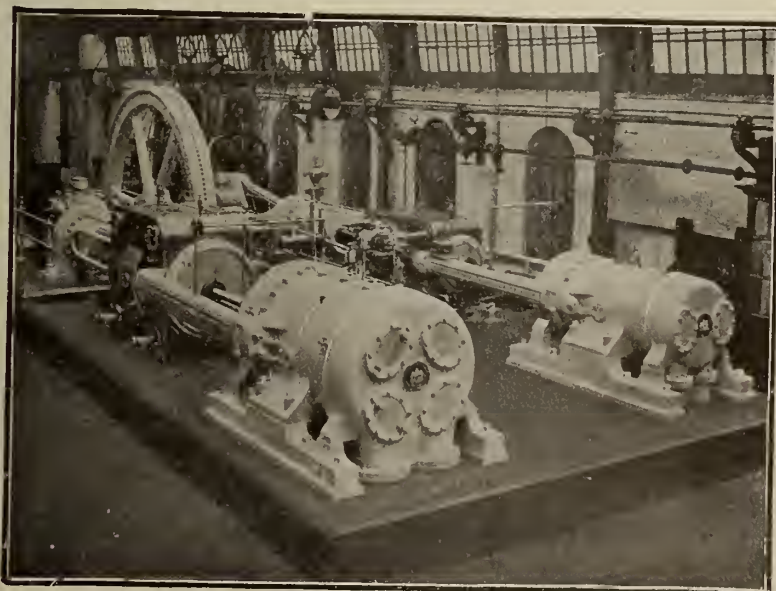
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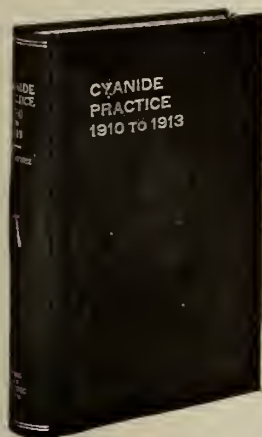
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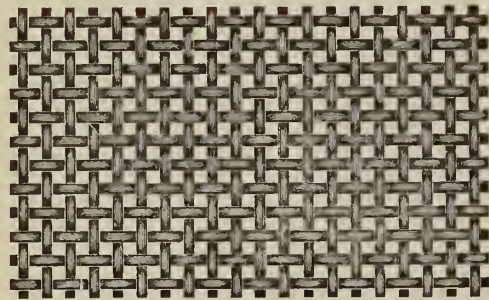
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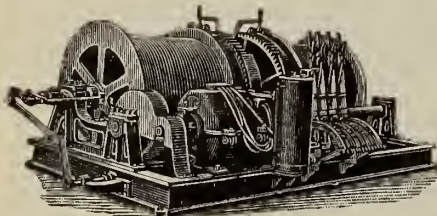
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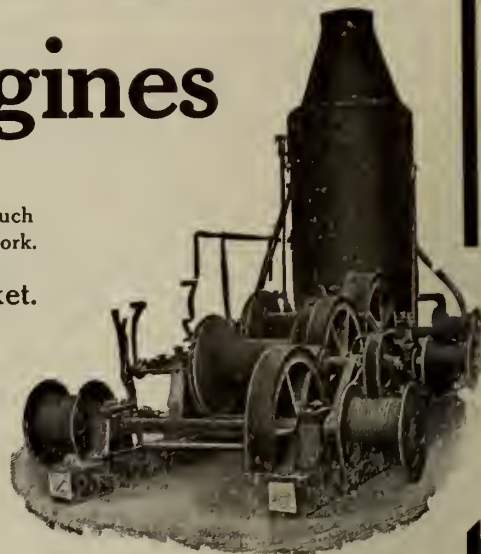
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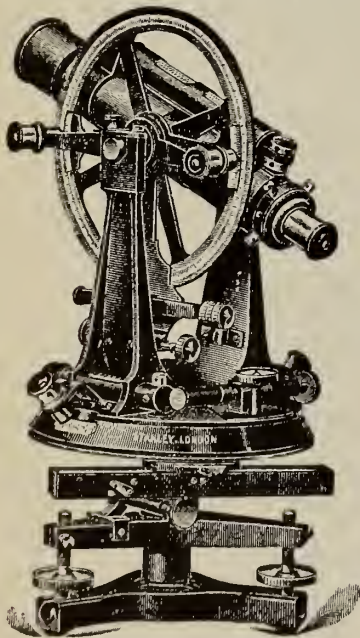
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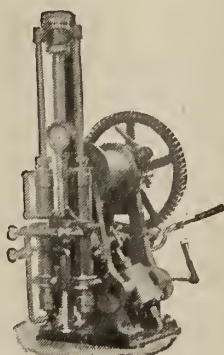
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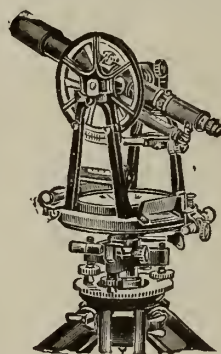
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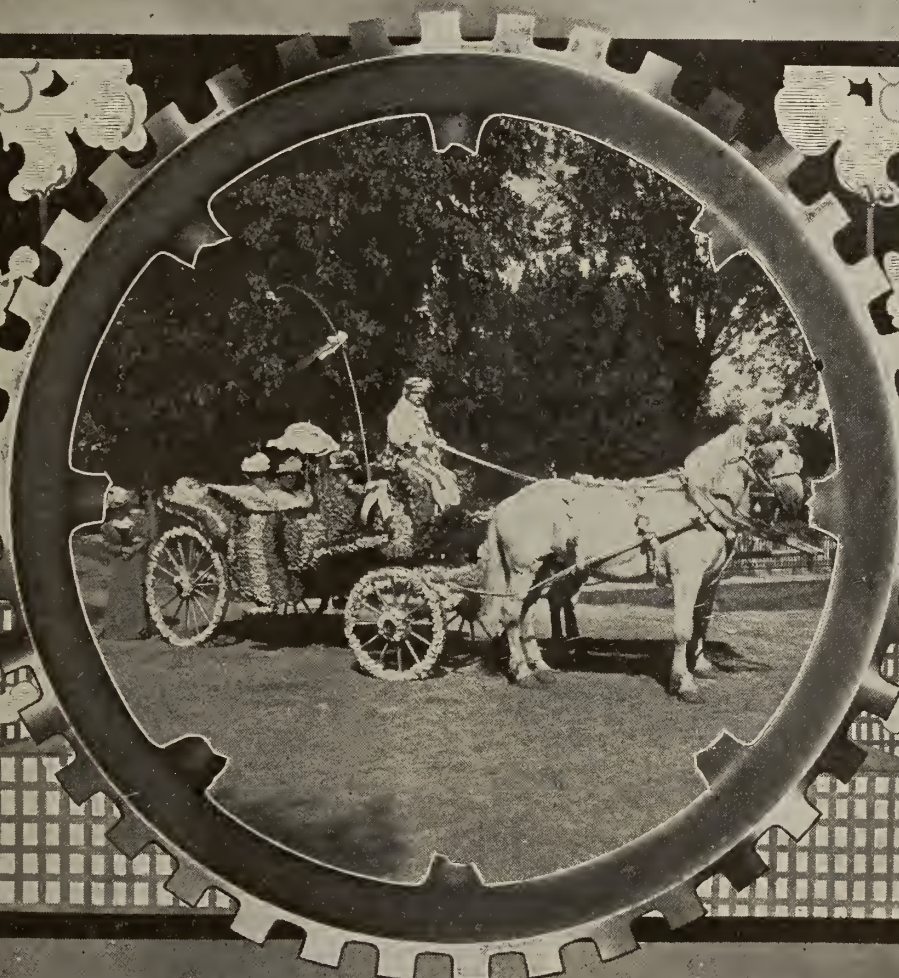
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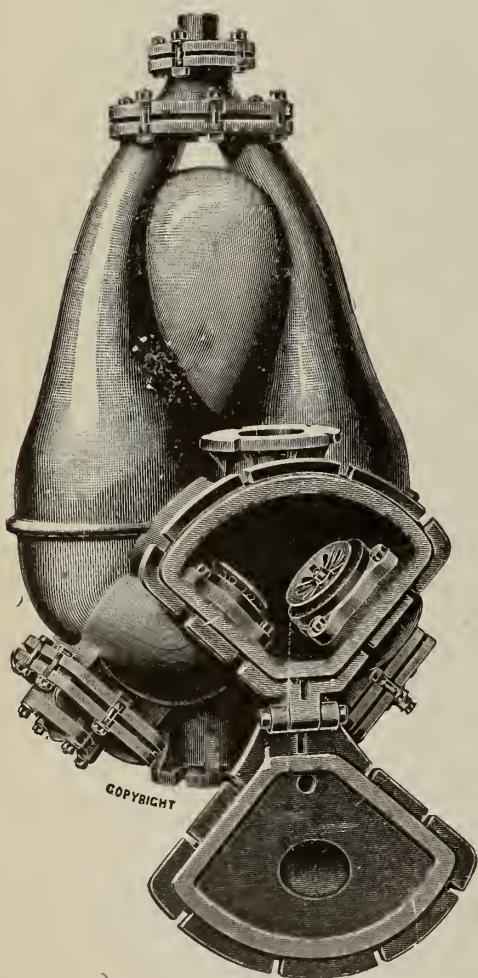


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REGINALD E. HORE

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## ONTARIO'S NEW PREMIER

The choosing of Hon. W. H. Hearst to be Premier of Ontario, is a recognition of the ability of the man whom we have been fortunate during the past few years in having in charge of the Department of Lands and Mines of Ontario. The new Premier is keenly interested in the development of Northern Ontario and to a greater extent than most of his predecessors he has an intimate knowledge of conditions in those parts of the Province which are most in need of exploration and development.

The agricultural and mining possibilities of Northern Ontario are beginning to be appreciated, but as yet we cannot claim that we have accurate knowledge concerning a very large part of this magnificent Province, which stretches from the Great Lakes to James Bay. The fringe along the Great Lakes and more particularly the comparatively small area lying immediately north of Lakes Erie and Ontario has long been settled. But the greater part of Ontario is an undeveloped country.

Manifestly it is one of the most important duties of the Provincial Government to determine the resources of this vast territory and direct attention to them. Much was accomplished by the Whitney Government in this regard and good progress is being made. The new Premier is unusually well qualified by knowledge of the conditions and by natural ability to so shape the Government's policy that renewed vigor will be given to the development of New Ontario.

## THE NICKEL INDUSTRY

The production of nickel and copper ore in the Sudbury district has fallen off greatly since the war began. The Mond Nickel company, an English company which refines its matte in Wales, has continued producing at a normal rate, but the Canadian Copper company, a subsidiary of the International Nickel company, has closed down several mines and confined production chiefly to the rich ore deposit at Creighton. This policy of decreasing production and stopping development work has necessitated the discharge of many employees.

At first thought it seems strange that a company producing nickel should be so crippled in time of war. Obviously a great demand for nickel by the countries at war and by neutrals is to be expected, for nickel-steel, an alloy containing 2.5 to 3.5 per cent. nickel, is for many war purposes unrivalled. It is, of course, probable that Germany in planning for war laid in large stocks of nickel-steel and would have continued to increase her stocks if the British fleet had not made it impossible. Nickel has been declared by Great Britain and by France contraband of war and the enemy's supply at once cut off.

On the other hand it seems surprising that there has not been a demand from the Allies and from neutrals which would make up for the loss of German business. The natural conclusion is that Germany must have been recently absorbing a very large proportion of the nickel shipped to Europe. Another possible explanation is that the stocks of nickel being usually large any temporary increase in demand can be met without continuing production at a normal rate until the situation clears up.

At present Great Britain, France, Russia and all neutral countries are able to buy all the nickel they want, while the enemy is unable to obtain delivery of what he has already contracted for. No embargo is necessary to maintain this satisfactory condition so long as Great Britain controls the seas.

Canada and New Caledonia, a French colony 900 miles east of Australia, produce nearly all the world's nickel ore. Norway is a small producer. A writer in the "Toronto Star" having made the discovery that the British Empire and France control the supply of nickel ore demands that we should prohibit the export of nickel as it may be used by the enemy for our own destruction. Certainly the Allies have it in their power to do so. Fortunately, however, such a drastic measure is unnecessary and would in fact work more to the disadvantage of the Allies than to the enemy. Manufacturers of armour plate do not want nickel ore in these times. They want nickel and nickel-steel. Obviously there is no sense in Canada putting an embargo on refined nickel for we produce only nickel matte. And if we place an embargo on nickel matte we are simply cutting off one of the sources of refined nickel on which at present the Allies can draw while the enemy cannot. We can hardly hope that Germany will be foolish enough to expect the British fleet to let nickel cargoes pass on to Germany even if they are billed to merchants in neutral countries.

## REFINING NICKEL MATTE

Canada produces two thirds of the world's nickel; but exports it all in the form of matte. The "Toronto Star" wants this attended to at once. We hope that the International Nickel Co. and the Mond Nickel Co. will therefore take steps to have all nickel matte refined in Canada. The "Star" man is very much wrought up over it and if something can be done to relieve him we will be very much obliged. It will have to be done at once, however, and not more than two or three days should be spent in erecting the necessary plant and accumulating the chemicals to be used.

Possibly the easiest way to relieve the "Star" man's distress would be to move the New Jersey and Swansea plants bodily to Sudbury. Perhaps the information that Swansea is in Wales and that the Welshmen have no sinister designs on us might placate him a little. But if that New Jersey plant is not moved to Sudbury very quickly or a similar plant erected there before the end

of the week that "Toronto Star" editor and his correspondent, Judge Barron, will be very wroth.

Canadians would be very much pleased if all our exports were finished products. Nothing is to be more greatly desired. We would like to export armour plate and automobile parts instead of nickel matte; bread or flour instead of wheat; paper instead of pulp; in fact we would like to send out no raw materials. Every industry that we can successfully establish in this country adds to our wealth.

There are many reasons why we continue to export, as do most countries, some of our raw materials. The one consideration that outweighs all others is the market. If we cannot profitably to ourselves establish refining and manufacturing plants to treat all our raw materials here, we export such materials for treatment in plants in other countries. In this respect all countries are alike.

And so it is in the nickel industry. We hope sooner or later to see refineries established here. But we do not expect to see them until some company with sufficient capital to establish such an enterprise becomes convinced that such an undertaking will be a profitable one. Evidently the companies now refining nickel matte are of the opinion that the present location of their plants is the most suitable.

The "Star" is apparently of the opinion that the refineries should be located here whether it can be done profitably or not. While of the opinion that the establishment of plants here should be encouraged we cannot agree that companies should be forced into unprofitable undertakings. In locating a refinery there are many things to be taken into account. Not the least of these are the sources of all the materials needed in treating the matte.

## COPPER SMELTING IN CANADA

Owing to our proximity to the United States, which country alone produces over one-half of the world's copper, the Canadian copper industry seems a rather small one. We are, however, producing, notably in British Columbia, Ontario, and Quebec, no mean quantity, the total for 1913 being 76,975,832 pounds, valued at \$11,753,440.

The smelting of copper ores in Canada was first attempted in 1848 at Bruce Mines, furnace men being brought over from Wales. Since then splendid progress has been made and we now have several plants of large capacity, including two of the finest and most complete plants in the world. A description of these plants and an account of the development of the copper smelting industry is given by Dr. A. W. G. Wilson in a volume just published by the Mines Branch, Ottawa.

In the introductory paragraphs Dr. Wilson says:

"The art of copper smelting is now a well known and well established industry. It is probable that more than 95 per cent. of the metallurgical methods, appliances,



and machinery employed at any one plant were evolved from the ideas of many investigators working at many different places. Only a very small percentage of the ideas involved in the construction and operation of any one plant are attributable strictly to local talent. The day has long since passed when the efficiency of any copper smelting plant and its superiority to its fellows depends, except in rare instances, upon the careful guarding of its operating secrets. This conception is now so well recognized in the American copper industry that, practically, no copper smelting plant is closed to technical men who present proper credentials when applying for admission. The management of nearly all the larger industrial plants recognize that free interchange of ideas is of mutual advantage. In preparing this report every effort has been made to avoid introducing any descriptions of processes or methods which are considered business secrets by the operators. To make assurance doubly sure every chapter has been submitted to the executive staff of the works concerned for revision. The author is pleased to be able to state that while numerous small additions and corrections were added, no important sections were deleted in this revision."

This readiness of copper mining companies to impart useful information has been frequently spoken of and to it is commonly attributed no small part in the very rapid strides made in the metallurgy of copper.

After presenting an illuminating account of the development of the industry in the several Provinces, Dr. Wilson gives detailed descriptions of the plants of the Canadian Copper Co., and Mond Nickel Co., in Ontario and of the Consilodated Mining and Smelting Co. of Canada, Limited; Granby Consolidated Mining, Smelting and Power Co.; British Columbia Copper Co., and Tyee Copper Co. in British Columbia.

To these descriptions the author adds miscellaneous summaries and a chapter on statistics of copper production.

The report is a very interesting and useful one. It contains numerous illustrations made from photographs and drawings and should prove valuable both to technical men and the general public.

## LODE MINING IN YUKON

The Mines Branch, Ottawa, has published an interesting account by Mr. T. A. MacLean of the status of lode mining in Yukon. Mr. MacLean went to Yukon in May, 1912, for the purpose of examining the more important quartz deposits in the mining districts of Dawson, Duncan Creek, and Conrad, with a view to ascertaining their gold content and reporting on their probable economic value. Assisted by Mr. D. MacLachlan, he made a very careful investigation.

Placer gold was found on the Yukon as early as 1869. This river was further prospected between 1873 and 1878, and from 1881 to 1886. Bar mining on the Big Salmon, Lewes, Pelly, and Stewart rivers was conducted with increasing profit, until 1886, when coarse gold was first discovered in Fortymile region—the greater part of which proved to be in Alaska—and later

on Sixtymile and its tributaries: the latter being the chief producers of Yukon until 1896, when the Klondike creeks were discovered, and in 1898 and the following years, poured forth their wonderful stream of gold, which by the end of 1912 will have reached a total output valued at more than \$140,000,000.

Quartz mineral claims were first staked in 1899, about which time the Lone Star mine, situated at the head of Victoria gulch, came into prominence. Some development work was then undertaken; but this was overshadowed by the rich placer finds, and little was accomplished in connection with quartz.

The population of Yukon in 1900 was about 30,000, and the gold production \$22,275,000. In 1912, the population was estimated at 8,500, and the gold production at slightly over \$5,500,000; \$9,500 being produced by gold lode mining operations.

With the decrease in the production of placer gold, the hopes of the residents have for some time been directed to lode mining, and a certain amount of desultory work and development have been undertaken over a large area, but with only indifferent results. This is due, in part, to the following facts: (1) that prospectors were generally unfamiliar with lode mining; (2) that little or no high grade ore had been located, and consequently, capital for development of low grade was difficult to secure; and (3) that some considerable expenditures have been inadvisedly made on a number of properties.

Claims are located over wide areas throughout the mining districts of Dawson and Duncan creek in northern Yukon; Conrad and Whitehorse in the south; besides extensive areas in the White river and other outlying portions of Yukon territory.

Mr. MacLean gives detailed information concerning a very large number of properties. His report is accompanied by 6 maps, 39 sketches, and 40 photographs. The sketches are designed, primarily, with a view to their being of use to prospectors in the field: by indicating the points sampled on their various properties.

In summing up Mr. MacLean says:

"The examination herein described has verified the fact that throughout the whole district traversed quartz is found abundantly. It has also established certain preliminary values in connection with practically all the known deposits of the Dawson and Duncan Creek mining districts, and also in connection with at least a few of those in southern Yukon. A number of these deposits have proven sufficiently good to warrant the opinion that further development, accompanied by more detailed sampling, might demonstrate beyond reasonable doubt that the prospects have a future as mines. The chief among these are situated in southern Yukon, where the ore consists generally of quartz carrying argentiferous galena and gold. The Humper group of Mellers, Dail and Fleming, and the Venus mine, both on Windy Arm, show values in gold and silver which range from \$2 or \$3 up to \$96 per ton. The Whirlwind group and the Tally-Ho group, both on Wheaton river, show up well. In northern Yukon the prospects at Dublin gulch are considered to be good ones. Chief of these is the Stewart and Catto group, with values which range generally between \$3 and \$16 per ton. The Olive and the Eagle groups, adjoining these, are also worth while. The latter shows assay values as high as \$70.80 per ton, but has undergone little development.

"In the vicinity of Dawson are the Lone Star mine, the Violet group, the Mitchell, the Gold Run group, and others, deserving of mention. These properties could not, in one season, be examined in sufficient detail,



nor can the report on them be sufficiently final to interest capital. Mining methods, except in a few cases, have been crude and unscientific; and money has been expended in the vicinity of possible ore deposits rather than in the development and proving of these deposits. Methodical sampling has generally been neglected. The territory is in great need of more prospectors and lode miners, and of funds to finance them, as well as of mining engineers to direct and assist them.

"The cream of the known placer deposits has been already skimmed, and the Canadian people, as a whole, have benefited greatly as a result of mining operations in Yukon. Already, prospectors and miners now in the field have been encouraged by the interest shown by the Dominion Government in undertaking the work above described; and during the past season have frequently suggested that much good would result if the services of a mining engineer were constantly available throughout the district. Certain it is that the work of further testing the better properties, in addition to looking over others that have so far not been examined, should be pushed with vigor.

"In Dawson mining district, with its typical occurrence of free gold in spots, mill tests of quartz from such properties as the Violet, the Eldorado Dome, the Virgin mineral claim, the Mitchell, etc., should be made. This might be done by special arrangement with the owners of the Lone Star mill. It is believed that the latter company would be willing to work in harmony with the owners of these claims, to the extent of allowing such tests under the supervision of a government mining engineer, who would look after the interests of the different parties and check results. In the case of prospects at Dublin gulch, and of those in southern Yukon, the conditions are different. The gold here generally occurs either disseminated as minute dust or in refractory form with sulphides; hence these prospects will advantageously admit of more detailed sampling and assaying in connection with any further investigation of their individual extent and economic value.

"In connection with the placing in operation of the government diamond drills, it should be noted that there is very important work for them in proving the Whitehorse copper deposits at depth. It has been stated in this report that shipments of copper ore from Whitehorse amounted, during the season of 1912 to about 30,000 tons. It is important to Yukon that these operations continue, as they undoubtedly must, if the ore bodies are ultimately found to be of sufficient extent and value. The work of testing with these drills should, in the interests of the public, be supervised by a government mining engineer. It is probably unnecessary to refer to the fact that of the 200,000 square miles in this territory only the fringe has been scratched. Upon the government of the day devolves, in a measure, the responsibility for development of the Canadian frontier, and that it realizes this responsibility is amply demonstrated by such recent incidents as the Stefansson grant, for the purpose of northern exploration, and by similar aid in connection with the coming to Canada of the International Geological Congress during the season of 1913. As a result of this Congress, it is expected that, after looking over the Canadian field, mining engineers and geologists from practically every country will carry away with them a conception of the possibilities of Canada's mineral wealth, and advertise it the world over.

"It is, therefore, worth noting that this is a crucial period in the history of lode mining in Yukon, when, as yet, practically all the properties are at prospect stage; hence, too much stress cannot be laid upon the

necessity of giving the prospectors and miners further assistance. The latter, in many cases, have reached a point beyond which, through lack of means, they cannot go. If a further examination of the promising properties substantiates the opinion formed, as a result of the above mentioned preliminary examination, a report to that effect would be definite and conclusive, and capital for development would doubtless flow into the district. If even two or three properties were then placed on a paying basis, a great impetus would be given the lode mining industry throughout the whole territory. If, on the other hand, prompt aid along the lines suggested be now withheld, the district will probably experience a serious setback, and what has already been done during the past season will be rendered largely ineffective."

#### **"BUSINESS AS USUAL" ON THE RAND.**

"You may depend on it that no matter what happens supreme efforts will be made to keep the gold mines and mills of the Witwatersrand working at full capacity," remarked a well known mining man to a representative of the South African Mining Journal in reply to a question as to the outlook for a maintenance of operations along the Main Reef series. "And you can depend on it, too," continued our informant, "we shall succeed in these efforts and that there will be no appreciable diminution of production from the auriferous conglomerate beds of the Rand. Probably no other industry in the Empire is of such immense importance to Greater Britain in this critical juncture of our history than the gold mines of the Witwatersrand. Gold is one of the few articles that the world is prepared to buy in large quantities at the present time. It is essential not only to this country that the Rand, which produces nearly two-fifths of the gold output of the world and is by far and away the greatest industry in South Africa, should not be interrupted in any way, but it is of paramount importance to Greater Britain and to the trade of the whole Empire that our mines should continue to yield up gold, for gold whilst it is valuable in times of peace is doubly valuable in times of war. Yes, the industry will be kept going. The outlook for delivery of future supplies is very bright, and every possible precaution is being taken to ensure its ordered running."

#### **TO INVESTIGATE LABOR CONDITIONS.**

Hon. W. L. Mackenzie King, ex-Minister of Labor, has accepted a most important position offered him by the trustees of the Rockefeller foundation to conduct a world-wide investigation into ways and means of improving the relations of capital and labor and benefiting the conditions of the workers, etc. The foundation, which is backed by an endowment of upward of \$100,000,000, has selected Mr. King for the position as being the author and first administrator of Canada's labor legislation for the prevention of strikes and lock-outs and one of the best known authorities on the continent on labor and social problems. He will have full charge of the investigation, which will be searching and thorough, and will be conducted for years in the hope of securing legislative and industrial reforms throughout the world.

In speaking of the appointment Mr. King said:

"I have been granted by the foundation a perfectly free hand in the shaping of the work and necessarily it will involve the giving up of much of the political work to which I have devoted most of my time since 1908, when I resigned the position of Deputy Minister of the Department of Labor to enter politics."



## GOLD MINING IN THE CITY OF EDMONTON, ALBERTA

By F. J. Dickie.

In Edmonton since the outbreak of war the bars and banks of the Saskatchewan river, which runs almost directly through the centre of the city, are being once more worked for gold. In the early days and up to as

### LAKE SUPERIOR CORPORATION.

The annual meeting of the Lake Superior Corporation was held on Oct. 7 at Cambden, New Jersey. The old board of directors was re-elected as follows: J. Frater Taylor, W. K. Whigham, H. Coppel, F. McOwen, J. T. Terry, W. E. Stavert, J. S. Dale, C. B. Gordon, W. C. Franz, D. C. Newton, T. Gibson and Jas. Hawson. J. Frater Taylor was re-elected president of the company.



**SASKATCHEWAN RIVER AT EDMONTON**

The gravels are being panned for gold. In foreground is a gravel sorting plant from which some gold is recovered incidentally

late as 1900 miners worked on the river, making from three to fifteen dollars a day; but of late years the river has been deserted. With the outbreak of war and the possibility of many being out of employment the City Council turned their attention to the river bars. A number of old mining men, who settled in Edmonton after the rush to the Yukon constructed several sample "grizzlies." One of these was placed back of the City Hall, and for a few days demonstrations were given by experienced miners on how to work them. As a result within two weeks the river banks were dotted for several miles with "grizzlies" and about a hundred men are now at work in these unromantic diggings situated in the heart of the city and within sight and sound of its traffic.

The work is not easy, nor is any sudden fortune apt to be gained, the average daily clean-up per man running about one dollar and a half to two dollars per day, but more than sufficient is being made to keep the workers living. Many of the workers are married men with families dependent upon them.

Some of the miners have found a little difficulty in disposing of their clean-ups, not on account of the quantity so much as because many of the banks lack the necessary scales to weigh it properly. Then again, they are dubious of its quality, as some of the miners are inexperienced, and when collecting it by mercury method do not clean it properly, allowing impure matter to remain in the nugget. In the past week the Imperial Bank, which is accepting a good deal of the gold, took in about two hundred dollars' worth. It is difficult to estimate the amount mined in the last month, as many are slow to cash in their clean-ups.

Daily, as they become satisfied that there is a good living wage to be made, more persons are erecting their "grizzlies" along the river.

President Taylor, in addressing the shareholders, stated that the aim of the management since 1909 has been to concentrate the resources of the corporation on the building up of its largest earner, Algoma Steel Corporation, Ltd. In pursuance of this policy several assets have been sold.

The Algoma Steel Co. now has a steel plant equipped with every modern appliance, comprising 110 coke ovens, 3 blast furnaces, a Bessemer plant, an open hearth plant consisting of 740 ton furnaces with a 250 ton mixer, representing a steel making capacity of



**A Coal Mine on the bank of the Saskatchewan River, Edmonton, Alberta**



500,000 tons, rolling mills with a capacity of 400,000 tons of rails and merchant mills with a capacity of 80,000 tons per annum.

The geographical position of the plant places it in a commanding situation to supply the great and increasing market in the Canadian West, whilst the quality of the steel rails produced has an excellent reputation in Canada and the United States.

The company makes its own coke from coal from its own mines and operates its own limestone quarries. Very large deposits of iron ore have been located on the line of the Algoma Central and Hudson Bay Railway, one of the corporation's subsidiaries. These ores are continually used in the blast furnaces.

The corporation mined in the year ending June 30, 1914, 114,782 tons iron ore, 560,181 tons Cannelton coal, 140,125 tons Pocahontas coal and 300,828 tons limestone, and manufactured 433,679 tons coke, 311,904 tons pig iron and 325,680 tons steel rails.

Net earnings for the year were \$1,762,109.91, in addition to a surplus of \$172,855.99 in operating the coal and limestone properties.

A falling off in demand for steel rails is expected, and it is probable that mills will be installed for the manufacture of structural steel and plates.

## ASSAYING COBALT SILVER ORES

Mr. A. M. Smoot, in a communication to the Secretary of the Canadian Mining Institute, published in the September bulletin, discusses Mr. Campbell's paper on "Sampling Cobalt Silver Ores." Regarding methods of assaying he says:

The method of assay used in our laboratory, and I believe practised elsewhere both in the U. S. and Canada, is quite different from the straight scorification method used at Cobalt. Quarter or half assay ton portions of the pulp are taken, the former weight if the sample contains over 2,000 oz. per ton, the latter if the silver is less than this. The pulp is treated in beakers with strong nitric acid added a little at a time until danger of frothing is past. About 75 C.C. of acid is required for  $\frac{1}{4}$  A.T. portions and 100 C.C. for  $\frac{1}{2}$  A.T. portions. The solutions are heated on a steam bath until red fumes cease to be generated and then they are diluted with 200 C.C. of distilled water and allowed to stand until cold—best over night. It is very important that the solutions be allowed to stand before they are filtered because with certain ores containing much arsenic together with some antimony and lime, a white crystalline coating appears on the bottoms and sides of the beakers which cannot be detached by washing, or even scraping. This coating contains a little silver, and if it is not allowed to form in the original nitric acid solution it forms later on in the process and makes trouble. Insoluble residues are filtered off and washed thoroughly. If there is any coating on the sides and bottoms of the beakers which cannot be readily detached with a piece of filter paper, it is treated in the beaker with a hot solution of caustic soda which quickly disintegrates it. The caustic soda solution is acidulated with a little nitric acid and washed into the filter with the insoluble residue. Most of the silver is dissolved by the original nitric acid treatment and passes through the filters as silver nitrate, but a little remains with the insoluble. If the insoluble residues are large in amount they are dried and burned in crucibles, fused with sodium carbonate, borax glass, litharge and a reducing agent. If they are small, they are

dried and burned in scorifiers and scorified with test lead and borax glass. In either case, the lead buttons from the insolubles are reserved. Standard sodium chloride solution is added to the nitric acid solutions containing most of the silver in amount sufficient to precipitate all silver as chloride, but avoiding any considerable excess of the precipitant. The silver chloride is stirred briskly until it agglomerates and then allowed to stand for an hour until it settles and the supernatant liquid becomes clear. If it remains cloudy, rapid stirring is repeated and it is again allowed to settle. The clear solutions are filtered through double filter papers and the silver chloride precipitates transferred to the filters by a water jet and there washed slightly with water. The beakers are washed well with a wash bottle jet and any traces of silver chloride remaining in them are wiped off with small pieces of filter paper which are placed in the filters. Filters containing the silver chloride are transferred to scorifiers which have been glazed on the inside by melting litharge in them and pouring away the excess. The glazing is done to prevent the porous scorifiers from absorbing moisture from the damp paper, and as a further protection, a small disk of pure sheet lead is placed beneath the filter papers. The scorifiers are transferred to a closed oven heated to about 250°-300°C., where they are dried and the paper is slowly charred until it is practically all consumed except a small amount of carbon. This method of burning the filter papers is an essential step, since it avoids losses of silver chloride which are apt to occur if the burning is done rapidly in a muffle. Fine test lead is sprinkled over the burned silver chloride residues and the lead buttons resulting from the crucible fusions or scorifications of the corresponding residues insoluble in nitric acid are added. Scorification is then conducted at a low temperature so as to obtain 15-gram lead buttons. These are cupelled at a low temperature, taking care, in the case of large silver buttons, to avoid "spitting" at the end of the cupellation.

This combination method, properly conducted, yields results higher and more concordant than can be attained by any all-fire process. It is, nevertheless, a commercial assay and is acceptable to the smelters since it does not include slag and cupel corrections. Inasmuch as all impurities likely to effect variations in the volatilization and slag losses are removed prior to the fire work, the results of assays made on different days and in different muffles, under different conditions, are more uniform than when the fire assaying is done directly on the untreated ores.

## WILL INVESTIGATE IRON MINING INDUSTRY.

Pursuant to a request made to the Dominion Government for the granting of some measure of assistance toward the development of iron ore mining in Canada, and in accordance with the statement of the Honorable the Minister of Finance in his budget speech during the 1913-14 session of Parliament, that the iron mining industry would be investigated, a committee has been appointed to enquire into the situation and to report the facts to the Government.

Every owner or operator of an iron ore property in Canada should be interested in facilitating this enquiry and should communicate with the Deputy Minister of Mines at Ottawa, or the secretary of the committee, who will furnish a schedule of questions covering the information required by the committee.



# THE MOND NICKEL COMPANY'S SMELTING PLANTS AT VICTORIA MINES AND CONISTON, ONTARIO\*

By A. W. G. Wilson.

The Mond Nickel Co. owns about 4,500 acres of mining lands, in fee simple, and controls about 2,500 acres under lease, a total of 7,000 acres in all, situated in the townships of Blezard, Denison, Snyder and Garson, Sudbury district, Ontario; additional areas have also been acquired recently. The ores mined are deposits of nickeliferous pyrrhotites containing some chalcopyrite, and occurring in norite; they contain about 2.3 per cent nickel and 1.75 per cent. of copper in addition to small amounts of gold, silver, platinum and palladium. For many years the principal property was the Victoria mine, first opened about 1899. Two ore bodies, about 160 ft. apart, occurred on this property. They lay with their longer horizontal axes almost on an east and west line, and had a uniform dip of about 75 degrees towards the east. Development work was by diamond drilling, followed by shaft sinking and the running of levels. The main shaft is a 3-compartment shaft, 800 ft. in depth, 4'  $\times$  12' inside the timbers; ten levels have been driven from this shaft to reach the ore body.

The other important mine which has supplied ore for a number of years is the Garson. There are two ore bodies at this mine, about 100 ft. apart, and the development and mining have been through a 500 ft. shaft.

Extensive diamond drill work, based on the results of magnetic surveys, has shown the existence of a large body of ore on property belonging to this company, adjacent to the Frood mine, lot 6, concession 6, township of McKim. Preparations are now being made to mine this ore body on a large scale.

The company also owned and operated a smelter at Victoria Mines, Ontario, on the Soo branch of the Canadian Pacific Railway, about two miles from the Victoria mine, and 22 miles west of Sudbury.

The company has erected a modern and fully equipped plant at Coniston, about seven miles east of Sudbury. The new plant is more conveniently situated with respect to railway transportation and the future ore supply. Descriptions of both the old and the new works are included in the present report.

The ore supplied for the old plant was conveyed to the roast yards and thence to the smelter over a Bleichert aerial tram line, 11,000 ft. in length. Ore from the Garson mine was brought about 31 miles in 50 ton bottom dump steel railway cars to Victoria Mines; from here a portion was sent to the roast yards over the tram line and the balance went directly to the furnaces.

Ore supplies for the new smelter will be derived chiefly from the Garson and the Frood mines, a portion of the ore body of the latter being on the property of this company. The haulage distance to the new roast yards, about a mile and a quarter from the smelter, will be 10 and 12 miles respectively, chiefly over the Canadian Northern Railway.

Power for the Victoria mine and smelter was furnished by a hydro-electric plant, owned by the company, and located at Wabagishik Falls on the Vermilion river, in Lorne township, and about eight miles from Victoria Mines. Power for the Garson mine was procured from the lines of the Wabapitae Power Co., whose two power plants are located on the Wanapitei

river not far from Coniston. The new smelter is operated by Wanapitei power.

**Historical.**—In the year 1899 the company began operations in the Sudbury district by extensive stripping and other development work at the Victoria mine. This work included the building of roads, the preparation of a roast yard and other preliminary work. In 1900 the smelter was erected on its present site, under the supervision of Hiram W. Hixon. The Bleichert tram line, 11,000 ft. in length, was installed by the Trenton Iron Co. of New Jersey to connect the mine, roast yards and smelter. The furnaces were first blown in early in 1901. The mine and smelter were closed down in December, 1902, and were not again in operation, except for a few months in the summer of 1903, until near the end of 1904. Since that date the plant has been in continuous operation, with only slight interruptions. The first furnaces were 44"  $\times$  120" at the tuyeres; in 1908 the plant was remodelled and the size of the furnaces was increased to 44"  $\times$  180".

In 1911 the site for a new smelting plant was selected at a point about 2 miles from Romford Junction on the Canadian Pacific Railway, conveniently located, both with respect to two transcontinental railway lines and to the principal mines owned by the company. A new modern smelting plant has been erected on this site. Two blast furnaces, 50"  $\times$  240", have been erected and space for a third is provided. Two Peirce-Smith basic converters, 10'-0"  $\times$  25'-10", are also installed. All the auxiliary equipment necessary has been provided.

## Victoria Mines Plant.

This plant has ceased operation. It has, however, served its purpose well and has been an important factor in the development of the copper-nickel industry of the Sudbury district. A brief description of the equipment and the method of operation is of interest and may also be of future value as a matter of record.

**General Statement of Equipment.**—The plant is equipped with two water jacketed blast furnaces, 44"  $\times$  180", each capable of treating 400 to 450 tons of ore charge per day, under present practice. The converter building is equipped with two electric operated converter stands, and 6 shells, each 84"  $\times$  126", and a 30 ton, three-motor, Morgan travelling crane. Power is electric, supplied by the company's plant at Wabagishik falls on the Vermilion river; a boiler plant is held in reserve at the smelter. The blower plant includes two Connersville blowers, and a Nordberg compressor for the converter air. The buildings include office and laboratory, engine house, well equipped shops, club house, boarding houses and about 40 detached dwellings.

**Bleichert Tram Line.**—This tram line is 11,000 ft. in length and runs from the Victoria mine to the smelter. It is equipped with loading terminals at the mine, at the roasting yards and at the smelter, and with discharging stations at the roast yards and smelter. The buckets each hold about 700 lb. and travel the 2 miles from the mine to the smelter at such a rate as to deliver about 100 loads per hour. The roast yards are located between the mine and the smelter and about

\*Extracts from "The Copper Smelting Industries of Canada," by A. W. G. Wilson, Mines Branch, Ottawa.



half a mile from the latter. Ore from the Garson mine is delivered into tram bins near the smelter by Canadian Pacific Railway ore cars; this ore is then raised by a small skip to charging bins on the tram line whence it is conveyed to bins at the roast yard. The tram line also carries Victoria mine ore to the roast yards, roast ore to the smelter and waste rock from the Victoria mine to the dump. The operation of this tram line is such that each bucket is idle for only a short portion of the entire round trip from Victoria mine to smelter and return.

The difference in elevation between the mine and smelter is only about 160 ft. Owing to the heavy duties required of the tram, this fall is not sufficient to operate it, and additional driving power was furnished by 30 h.p. motor installed at the lower end.

**Flue System and Stacks.**—The downtakes of the blast furnaces lead to a steel dust flue with continuous V bottom. Slides are provided on either side at about 4 ft. centres, for the removal of flue dust. The main stack is of steel plate and is about 115 feet in height. The lower part of the stack, about 24 ft. in height, is shaped as a truncated cone, the upper portion is cylindrical. The converter flues connect with the main stack.

**Buildings.**—The smelter building is a steel frame structure, covered with corrugated iron sheeting. The electrical sub-station, in which the power plant was also placed, was a wooden trussed brick building with concrete floors, 50'  $\times$  90'; the roof was composite, being covered with corrugated steel on the outside and lined with matched pine. The various shops were housed in wooden structures.

**Coke, Fluxes, Silica.**—The coke used in the furnaces comes from Pennsylvania. It is shipped by water to Algoma Mills, 73 miles west of Victoria Mines, where it is loaded into box cars, or coke cars, and hauled to the smelter by the Canadian Pacific Railway. The freight charges amount to about \$5.60 per ton on coke that costs \$1.10 per ton at the ovens.

Limestone, which forms about 4 per cent. of the furnace charge, is obtained from the Fiborn quarries in Michigan.

**Blast Furnaces.**—The two furnaces are each 44"  $\times$  180" at the tuyeres. They are mounted on concrete foundations at an elevation of 6 ft. above the converter floor. The superstructure is of structural steel above the charging floor; the hood, stack and downtake leading to the flue are of steel plate. They are water-jacketed steel furnaces with brick tops, and cast-iron sole plate 2 in. thick. Their capacity is 400 to 450 tons of ore charge per 24 hours for each furnace, under the present method of operation.

The furnaces as originally constructed each consisted of two tiers of water-jackets, three jackets on each side to each tier. The upper tier has now been replaced by brick; the inside brickwork is of firebrick, the outside of common brick. The furnaces are charged from the side, the charge doors being operated with a pneumatic lift. The charging floor is 14 ft. above the tapping floor. The furnaces are provided with special water-cooled cast-iron spouts, each provided with only one set of water pipes. The spouts are lined with chrome brick and similar brick is also used at the tap holes. The crucible is built within a plate steel box, and is carried by the sole plate. Chrome brick laid in magnesite cement is used for this; the magnesite cement is mixed with magnesium sulphate water.

The settlers are circular, each 12 ft. in diameter and 4 ft. in depth.

**Converters.**—There are two electrically operated converter stands and six Allis-Chalmers improved, 84"  $\times$  126" shells. The stands are operated from a pulpit by individual controllers and air valves. The converter shells and 5 ton cast-steel matte ladles are handled by one 30-ton, 3-motor Morgan travelling crane.

Lining for the converters is prepared by a 7"  $\times$  10" Blake crusher, and two 6 ft. Chilian mills direct connected to a 30 h.p. direct current motor.

**Blower Plant.**—Air for the blast furnaces is supplied by two Connersville blowers, each having a capacity of 15,340 cubic ft. of air per minute at 40 oz. pressure running at 130 r. p. m. Each of these is belt connected to a 200 h.p. constant speed motor, taking current at 550 volts, and running at 580 r.p.m. The air pressure at the furnaces is about 38 oz. Air from the blowers is delivered to a common receiver, and conducted to the bustle pipe of the furnaces. Bustle pipes run along each side of each furnace and across one end.

Air for the converters is supplied by a Nordberg duplex air compressor, capacity 6,000 cubic ft. of free air per minute, compressed to 12 lb. pressure, at 82 r.p.m. The low pressure cylinder is 34 in. in diameter, the stroke 42 in. The flywheel is 18 ft. in diameter and is grooved for 18 ropes each 1.25 in. in diameter. This machine is driven by a constant speed 315 h.p. induction motor running at 345 r.p.m., receiving current at 550 volts. This blowing engine is fitted with mechanical inlet Corliss valves and poppet discharge, and is regulated by the air pressure from the receiver through floating levers to the governor, this controlling the cut-off on the Corliss inlet-valves.

Fine dust is drawn from the flue through the slide doors into a barrow. It is wetted and fed to the furnace from hand barrows.

**Smelting Practice.**—Roasting—About two-thirds of the ore treated is first sent to the roast yards, about half a mile from the smelter and north of Victoria Mines station. Green ore is received at the tramway unloading station in the roast yards and dumped in a pile. Here it is shovelled into buckets and hoisted to the level of the staging that is built over the roast yards and is loaded into end-dumping hand lorries, holding about 1,000 lb. each, which are pushed by hand to the roast piles. Each roast pile, when completed, contains about 3,000 tons of ore and covers an area of 40'  $\times$  150'; the piles are built in a row, with the longer axes parallel, and about 10 ft. between piles. To build a new pile a light pole staging is erected over the roast bed, and rails are laid in this staging to accommodate the lorries. A bed of dry wood, about 3 ft. in depth, carefully and properly piled, is then laid as a base for the proposed roast pile. Upon this wood ore is piled, to a depth of about 10 ft. A top dressing of 8 in. to 10 in. of fine ore is then spread over the top of the pile and down the sides and ends. The rails and stringers of the staging are then removed, the poles being left standing in the pile. The wood of the pile is then ignited; the whole pile will be alight in about four days. The pile is carefully watched, blow holes are stopped whenever they appear, and the roast continues for about 100 days, by which time about half the sulphur has been burned out, the green ore containing about 20 per cent. of sulphur, at the start.

After cooling, the roast heaps are loosened up by blasting. The roasted ore is shovelled by hand into cars and hauled by a horse to the aerial tramway. Here it is hoisted by a skip and dumped into the loading bins. Three men are required at the hoist in the roast



yards; two men are required on each lorry; about 15 men in all are employed in these yards. The average output of the yards per day is, approximately, 475 tons of roasted ore, when the plant is operating at full capacity.

All ore from the Victoria mine is weighed into the roast yards at the mine; that from the Garson mine is weighed at the smelter before being sent to the yards. All roasted ore is weighed out of the yards.

**Smelting.**—At the smelter, ore, coke and fluxes are all stored in bins placed with their discharge chutes above the level of the charging floor, so that the charge barrows can be run beneath them. The furnaces are charged by hand lorries holding about 800 lb. each. The ore charge consists of two parts roasted ore to one part of green ore; the coke makes up about 8 per cent. of the whole charge. A typical charge will consist of about 1,200 lb. of roasted ore, 600 lb. of green ore, 300 lb. of scrap and slag, including 75 lb. of limestone and 250 lb. of coke.

The practice is to granulate the furnace slag, which is then flushed out to the edge of the dump.

### Coniston Plant.

The site for the new plant at Coniston was chosen only after very careful surveys. The new smelter is located on a rocky hillside overlooking a large swampy flat which gives ample storage room for large slag piles.

The roast yards are located about three-fourths of a mile from the smelter, to the south-east, on the other side of the ridge at whose foot the smelter is placed. They are connected directly with the Canadian Northern Railway and the Canadian Pacific Railway, and are also connected with the smelter by a spur line belonging to the company.

A new townsite has been selected and laid out, north of the Canadian Pacific line and about one mile from the smelter. Coniston will be a model town provided with every modern convenience.

**General Statement of Equipment.**—The main smelter building has a concrete substructure resting on bed-rock, and a structural steel superstructure. In this building are placed two new modern water-jacketed



New Smelter of Mond Nickel Co., Coniston, Ont.

**Converting.**—The furnace matte, containing about 33 per cent. copper and nickel, is collected in the settlers, which are tapped at intervals. From the settlers furnace matte is run into pots, which are lifted by the travelling crane and charged directly into the converters. Matte from No. 1 converter is blown up to about 60 per cent. copper-nickel. It is then skimmed and the slag is sent to the furnace settler while still hot and liquid. The matte from converter No. 1 is then charged to converter No. 2, and blown to about 80 per cent. copper-nickel. The slag from this converter also goes to the furnace settler, and the matte is run into a pot, from which it is poured on a matte bed to cool. There are four of these matte beds, each 4'  $\times$  15'. It is customary to draw matte from the settlers at the same time as converter slag is being poured, thus preventing the overloading of the granulating streams.

The final Bessemer matte produced contains about 38 per cent. copper and 42 per cent. nickel, and about 15 per cent. iron, the balance being sulphur and other impurities. It is broken up on the beds, put into barrels, and shipped to the Mond company's refining works at Swansea, Wales.

blast furnaces, 50"  $\times$  240", and two Peirce-Smith converters, 10'-0"  $\times$  25'-10". Provision has been made for an additional blast furnace which will be added when required. The power building is located on the hill above the smelter. The ore bins are placed beyond this and a rock house stands south-east of the smelter and over the lower tracks. A semi-circular track leads from beneath the ore bins to the charging floor of the smelter building. It is carried over the slag tracks on steel trestles resting on concrete piers.

**Receiving Ores.**—Spur lines have been built connecting both the Canadian Pacific and the Canadian Northern Railways with the roast yards, the smelter yards and the smelter ore bins. Ores from the mines to the north will come into the roast yards over the tracks of the Canadian Northern Railway and can be delivered directly to the yards, or shunted over the company's spur line to the smelter bins. Ores from the west will be diverted to the Mond Nickel Company's spur line at Coniston station, and can be run either to the smelter bins or to the roast yards. Ore from the roast yards can also be conveyed over the spur line to the smelter bins on the high line above the smelter.



**Power.**—Power to operate the plant is entirely electric and will be obtained from the power lines of the Wahnapitac Power Co. This corporation has two power stations on the Wanapitei river not far from Coniston.

**Buildings.**—The main smelter building is of steel construction with a concrete substructure,  $90' \times 360'$ , resting upon solid rock; there is a monitor on the roof running the length of the building. A lean-to shed,  $21' \times 240'$ , on the north-west side, houses the converter plant; a similar lean-to, on the south-east, about  $30' \times 210'$ , covers the slag track and the main flue.

A slag cut on the south-east side is provided with a standard gauge track. The tapping floor is 14 ft. higher, and the charging floor 24 ft. 2.5 in. above this. The furnace platform is 24 ft. in width and 210 ft. in length. The matte floor on the north-west side is 10 ft. below the level of the furnace floor and about 56 ft. in width.

the slag out. Six chutes deliver from this hopper to a car placed beneath.

**Blast Furnaces.**—There are two Allis-Chalmers rectangular water-jacketed copper blast furnaces,  $50'' \times 240''$ , each furnace being provided with a brick lined steel crucible and a brick top above the single tier of jackets. The height of the furnace is 32 ft. 2.5 in. to the base of the hood; the hood measures 12 ft. 6 in., giving a total height of 44 ft. 8.5 in. A goose neck, 7 ft. 6 in. in diameter, connects each furnace with the main flue, and a straight stack, closed by a damper, rises 15 ft. above the hood.

Each furnace is carried on structural steel columns, the jackets being hung from I beams. The crucible rests on three rows of nine supporting columns each 5 ft. in height. It consists of a rectangular steel frame about 6 ft. in width, 21 ft. 9 in. in length, and 25 ft. in depth, made of I beams; the sole plate is of cast-iron



Charging a basic Converter, at new smelter of Mond Nickel Co., at Coniston, Ont.

The power house built on the hill south-east of the smelter, is a brick and steel structure with concrete foundation and a tile roof.

**Flue System and Stacks.**—The main flue is rectangular in cross-section  $10' \times 15'$ , built of sheet steel. It leads to a dust chamber  $30' \times 50'$ , built of stack brick, which connects the base of the stack. The main stack rests on bed-rock; the lower 25 ft. of the stack is square in section and is built of red brick, the upper cylindrical portion, about 16 ft. in diameter, is built of Custodis stack brick. The height is about 175 ft.

The main flue is provided with 27 hoppers, placed at 7.5 ft. centres, in sets of two, between the main bends of the supporting structural steel work. There are also four large hoppers placed between the main flue and the brick dust chamber. The bottom of the dust chamber is fitted with 6 rows of steel hoppers, 9 to a row, the distance from centre to centre being 56 in. Each hopper is provided with a circular discharge gate 13 in. in diameter, closed by a lever operated slide. The hopper chutes beneath the dust chamber deliver to a common space so arranged that the flue dust can be run into a V-shaped auxiliary hopper of sheet steel hanging above a standard gauge track in

in four sections. This crucible box is lined with chrome brick around the sides, ends and bottom, reducing the internal width to 4 ft. 2 in.

Above the crucible there is a single tier of water-jackets, eight on each side, each 8 ft. 2 in. in height. The width of the furnace is 4 ft. 2 in. at the tuyeres, at the top of the water-jackets it is 5 ft. 9 in.

The throat of the furnace above the water-jackets is built of ordinary brick and lined with firebrick, forming a jacket 12 in. in thickness, the top being 3 ft. 7 in. below the charging floor. The space between the charging floor and the top of the brickwork is bridged by inclined apron plates.

At the ends of the furnace the brickwork is carried to the top of the furnace 8 ft. above the charging floor. The charge doors along the sides of the furnace are operated by counter weights.

The settlers are about 15 ft. in diameter. They are placed beside the furnaces and discharge matte and slag from opposite sides.

The furnaces are placed parallel to the length of the building and may be charged from either side. Space has been provided for three, but only two are being installed at the present time.



**Converters.**—The converters installed in the new plant are of the Peirce-Smith type of basic converter with shells 10 ft. in diameter and 25 ft. 10 in. in length. Two have been installed in the building.

The lining of each shell consists of 16 in. silica brick and 9 in. magnesite brick at the bottom, and 9 in. magnesite brick at the top. At the tuyeres special 18 in. magnesite brick is employed.

Each shell is provided with 30 tuyeres placed 14 on one side of the stack and 16 on the other, none coming directly below it.

The blowing stack is 3 ft. 7 in. in diameter, but the lining reduces the free space to 2 ft. 9 in. It is placed near the median riding track, its centre being 11 ft. 2 in. from the end of the shell opposite the bustle pipe. The pouring spout is placed 7 ft. 7.5 in. from the same end and about 77 degrees of arc below the stack.

The ends of the shell serve as annular tracks upon which it may be rotated, and a third riding track placed 7.5 in. to one side of the middle of the length of the shell has also been provided. The track rests on rollers carried on cast-iron bearing plates, bolted to a concrete foundation.

The shells are turned by steel ropes, pulled by a sliding gear operated by an electric motor and a worm screw, with an 8 ft. stroke.

The converter floor is served by two 50 ton Whiting cranes.

#### Wabagishik Power Plant.

The hydro-electric plant belonging to the company is located at Wabagishik falls, on the Vermilion river, 8.5 miles from Victoria Mines station on the Canadian Pacific Railway.

The power house is a concrete block structure, 46' × 90'. It is equipped with an overhead travelling crane of sufficient capacity to lift the heaviest single piece of the turbine unit.

The steel pipe line leading from the dam to the power house is 450 ft. in length and 8 ft. in diameter.

The main turbine is of the horizontal twin type, with a pair of cast-iron runners secured to the main shaft, all enclosed in a steel housing arranged so that the water enters parallel to the shaft, and discharges into a common draft chest. The top part of the housing is made in removable sections to facilitate quick inspection of all internal parts. The regulating gates consist of two sets of movable guide vanes, operated between two rings moved by short links and regulating rings that are connected to the regulating shafts by rods and levers.

The machine is governed by an hydraulic cylinder with piston connected by rods to the gates and operated by a geared pump and pressure cylinder. This pressure cylinder is provided with a fly ball governor, driven by belt from the main shaft, by which oil, under pressure, is admitted to either end of the oily cylinders, as required.

The turbine is designed to operate with 500 cubic ft. of water per second under a 50 ft. head, when running 300 revolutions per minute at a power factor at 80 per cent. It is direct connected to a 1,200 kw. 60 cycle. 3 phase, 2,200 volt, alternating current generator. This machine, when running under load, generates from 800 to 1,300 kw., the latter being the peak load when the mine hoist is suddenly thrown into action.

The exciter unit consists of one single horizontal shaft turbine, mounted in a cast-iron casing, with regulating gate made up of guide vanes pivoted on pins between two heads, and operated by means of a split regulating ring on the front head, connected by links

to the governor. The generator is direct connected to the shaft, and is a 60 kw., 120 volt machine. It is designed to operate on 27 cubic ft. of water per second, at 50 ft. head, when running 857 r.p.m.

The switchboard apparatus at this power plant consists of one panel for control of the exciter, one panel for control of the generator, and one line panel provided with 16,500 volt lightning arrester and accessories.

The generator voltage is 2,200. This is stepped up to 16,500 volts for transmission over the power lines. The transformer equipment at the power house consists of one bank of transformers (three) of 800 kw. capacity each. Power is transmitted over a line of No. 6 copper wire.

The smelter sub-station was equipped with three 350 kw., oil insulated water cooled transformers, which stepped the power down from 15,000 to 600 volts.

The Victoria mine sub-station is equipped with three 200 kw. transformers, 15,000 to 600 volts.

#### MINING SOCIETY OF NOVA SCOTIA.

The Canadian Mining Institute has made a proposal of union to the Mining Society of Nova Scotia on the following terms:

The Mining Society of Nova Scotia to preserve its name and local self-government.

The Mining Society shall have the right to apply all grants and donations received by itself from all sources to its own purposes.

The approved papers read before the Mining Society will be published in the transactions of the Canadian Mining Institute and the name of the Mining Society of Nova Scotia will appear on the cover and title page of the volume.

Authors of papers will receive fifty complimentary copies free of cost.

Every member of the Mining Society will receive the regular monthly bulletin of the Institute, a copy of the Transactions, and any other publications of the Institute.

All members of the Mining Society, as classified by themselves, will enjoy the full rights and privileges of the Canadian Mining Institute.

In order to take advantage of these privileges an annual contribution of \$5.00, in addition to the regular dues, will be collected from each member of the Mining Society of Nova Scotia.

Regarding the proposed amalgamation, President F. H. Sexton says:

"The union or affiliation of the two societies cannot be effected until the whole proposition has been voted upon by our members at a regular meeting. It will be impossible to bring it about unless the members of the Mining Society of Nova Scotia are willing to contribute the sum of \$5.00 each toward this special purpose annually."

An unusual case came before Magistrate Atkinson in the Cobalt Police Court last week. Fred Graydon, who has a drilling contract at the Crown Reserve mine, was fined \$10 and costs for drilling into an old hole, an action which constitutes a breach of the Mining Act. Graydon had commenced drilling a short distance below the old hole, and, when a few feet in the rock, ran into the latter. The offence was quite unintentional, and the magistrate, taking this into consideration, imposed the minimum penalty. The case is supposed to be the first of its kind in Cobalt.



# THE IRON ORE DEPOSITS OF EASTERN AND WESTERN FRANCE\*

By Paul Nicou, Mining Engineer, Paris.

Now that France has become—during the last few years and owing chiefly to the development of the calcareous ores of the Briey ore field—one of the principal ore exporting countries, it will soon become a matter almost of necessity for the leading ore importing countries to arrange to secure a share of the output, in proportion to their respective requirements.

Belgium has become practically dependent on the Lorraine ores, and in 1912 received from Meurthe-et-Moselle 4,351,000 tons out of a total of 6,415,000 tons, or 67.8 per cent.

Within the German customs union, which includes the great industrial regions of Luxemburg, the Sarre, Westphalia and Silesia, the Lorraine ores are competing keenly with the local ores which in the first named locality have already been driven to seek their former foreign market. In the Sarre district they have arrested the progress of the imports from the annexed Lorraine province, and they are more and more firmly establishing a footing in Westphalia, whither the ores of Anjou, Normandy, and Brittany are also finding their way. The high iron percentages of the Briey minettes should, likewise, cause them to be sought after in the near future by works in annexed Lorraine which have hitherto contented themselves with ores produced in the immediate vicinity, but which will have to follow the example of Luxemburg, and even distant Silesia, with its rapidly diminishing local production of ore and heavy existing imports of Swedish ores, is contemplating obtaining supplies from certain French deposits in proximity with the sea coast.

Whatever the future may, however, bring forth, the imports of French ores into the Zollverein have now actually almost attained to an equality with those from Sweden, and have exceeded those from Spain, the two countries which, for a long time past have shared the German market. In 1913 they reached 3,810,887 tons, as against 4,558,362 tons and 3,632,058 tons from these countries respectively. The large interests acquired, more or less recently, by powerful German or Luxemburg companies in the Lorraine and Normandy ore fields; the reduction from frontier stations onwards, of the freight charges for the conveyance of ores towards Westphalia; and the possibility of employing in the latter route both rail and canal transport, with transshipment at Givet, cannot fail to increase the part played by France in the supply of the works in the Zollverein.

Side by side, however, with these two important customers of the French mines, there are other consumers who have hitherto availed themselves to but a very limited extent of these resources, and who may later on find on the French mainland the supplies they need.

The United Kingdom is amongst these. Her iron industry imports annually large tonnages of various ores, and statistics of the trade for 1911 and 1912, represented in metric tons, and compiled from the official sources, are given below:

Iron ores produced in the	1911.	1912.
United Kingdom .....	15,767,735	14,011,037
Imported ores .....	6,448,145	6,708,122
Purple ore .....	647,640	691,154
Total. ....	22,863,520	21,410,413

Ore exported or re-exported..	6,742	7,563
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Total available supply ....	22,856,777	21,402,850
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The imported ores amount therefore to 28.21 and 31.34 per cent. of the total available supply.

Besides this, the home production no longer increases in the United Kingdom. It was about 15,578,000 a year between 1906 to 1911; it reached 15,984,000 tons in 1907, and fell to 14,011,037 tons in 1912, the year of the general coal strike. The production of pig iron likewise remains almost stationary, oscillating between 9,201,000 and 10,346,000 tons during the period of 1905 to 1911 (average 9,875,000 tons), and attaining only 8,891,000 tons in 1912, which was an exceptional year. It results from this that Great Britain is a fairly constant customer abroad, and in those same years, 1905 to 1912, the tonnages of iron ore received varied only between 6,155,000 tons and 7,950,000 tons (average 7,066,000 tons).

Whence does the United Kingdom derive these tonnages? The following table gives the imports by countries of origin for the three last years for which statistics are available. The figures for 1913 have been estimated:\*

	1910.	1911.	1912.	1913.
Spain .....	4,932,280	4,008,735	4,358,629	4,598,256
Algeria .....	683,730	721,537	759,853	771,612
Sweden .....	381,779	433,721	362,449	372,558
Norway .....	252,572	270,476	408,540	495,604
Greece .....	326,456	267,584	197,013	206,901
Tunis .....	185,036	233,987	242,734	283,536
France .....	124,851	201,770	173,428	332,470
Various countries .....	246,428	310,335	205,475	208,858
Total. ....	7,133,132	6,448,145	6,708,122	7,969,795

Whilst therefore Tunis and Algeria furnish considerable quantities of rich, pure iron ores, the percentages of the total being, for 1910, 2.59 and 9.58 respectively; for 1911, 3.66 and 11.10; for 1912, 3.62 and 11.33; and those for 1913, 3.89 and 10.62 per cent., continental France only contributes 1.75, 3.12, 2.55 and 4.57 per cent. Her proportion has nearly tripled itself in three years, but still remains very small.

## Normandy, Anjou and Brittany.

Of all the French deposits which can actually supply the British iron trade with the ore it requires, those of the west—that is to say, of Normandy, Brittany and Anjou—are, from a geographical point of view, the most favorably situated.

The mines are, as a matter of fact, but a short distance from the sea, and even those which, as in the Segre district, are the furthest removed from the ports of embarkation, are but 85 and 135 kilometres distant by rail from Nantes and from Saint Nazaire respectively. The Norman mines of La Ferriere and Halzouze, which are the most southerly mines worked, are from 75 to 80 kilometres from Caen. The ports of

\*All the figures quoted in this paper are expressed in metric tons and are derived from the official returns. Those of 1913 are provisional only, and have been kindly made for the author by competent authorities.



landing, even, if not as yet quite up to the standard of modern requirements, will undergo within the next few years considerable improvements, which will not only facilitate the arrival at their quays of steamers of the highest tonnage, but will also permit of more rapid loading of the ore. Even the question of freights presents itself in a most favorable aspect, as all these western districts of France, far removed as they are from the home resources of fuel, have to draw upon foreign coal supplies—for the most part British—and the ore can the more readily be shipped as return cargoes, inasmuch as hitherto the colliers have generally made their return journeys in ballast.

Shipments from Caen recently have rapidly increased, more than doubling in a period of five years. The increase would have been even more rapid but for strikes (which at Caen stopped all production at some of the mines during 1912 and 1913), and had the handling appliances of the harbor been better. Secondly, the powerful interests acquired in a number of mining concessions in Normandy by German iron works, have had, as a first effect, the diversion of the exported ores towards Westphalia, yet a very marked increase to be noted during the two years towards Great Britain shows that the mines working independently have sought more particularly in this direction for an outlet for their shipments.

On the Anjou and Brittany coasts Nantes and St. Nazaire shipped respectively 135,423 tons and 138,151 tons in 1913, all of which went either to Great Britain or Germany.

#### Normandy Iron Deposits.

The Normandy deposit, properly so-called, which spreads over the three departments of Calvados, la Manche, and l'Orne, is, as a matter of fact, the second in importance amongst the iron ore producing areas of France, notwithstanding that in 1912 it only represented 4.08 per cent. of the total French output, whereas Meurthe-et-Moselle contributed 90.66 per cent. The 784,977 tons mined during 1912 mark, however, in comparison with preceding years, a considerable increase, seeing that from 1870 to the end of the year 1912 only 5,567,000 tons had been mined throughout the whole province.

The year 1913 continued to mark progress, with 861,000 tons, and an output of 1,000,000 tons will soon be attained, while the large plants laid down during the latter years, and those in course of construction at different mines, such as Soumont, Saint-Andre, Barbary, etc., justify the hope that in the near future even this million tons may be greatly exceeded.

Where does all this go to? An appreciable portion is even now consumed in the works in the North of France; Halouze and La Ferriere furnish the blast furnaces of Isbergues and Denain with rich siliceous ores; the Nord-et-Tst steel works at Valenciennes receive ore from Larchamp, and these three concessions worked on the syncline of La Ferriere yielded to these works alone 373,900 tons of merchantable ore, or nearly one-half of the total production. The new works under construction, such as those at Pont-a-Vendin, can similarly obtain from Normandy a considerable proportion of their ore burdens. Blast furnaces are also in course of erection at Calvados itself, in the immediate vicinity of Caen, and the mine in process of development at Soumont will find a market for its output in these works, the residue being sent to the Thyssen works in Westphalia. Other concessions, on the other hand, are being developed only for the purpose of exporting their ores, while others have concluded con-

tracts with their leading metallurgical customers—for the most part German—which will ensure the disposal of a large part of their production. The British market, however, to the development of which considerable efforts have been recently directed, presents itself under very favorable conditions; and whereas the exports to Germany have only risen 36 per cent. between 1911 and 1913, those to Great Britain have increased 75 per cent. While hitherto it has been the calcined carbonates and hematites of La Ferriere, Halouze and Larchamp which have been sent to Great Britain, the new undertakings, bent on increasing their outputs, are not failing, and will not fail, closely to watch the British market.

The ores of Normandy are of sedimentary origin. They are found in seams in the Silurian, or, more accurately, in the trilobitic schists of the Ordovician period. The ore generally outcrops in synclines, having a bearing N. 115 degrees E., and is more or less marked towards the east by Jurassic overburdens, which necessitates preliminary trial borings. Ore occurs also in the west, in the midst of Pre-Cambrian phyllades and eruptive rocks. Traversing the synclines one or more seams may be encountered. Generally speaking, in those of the north only one available or existing horizon is known, occupying a fairly constant position below the trilobitic schists, sometimes at their contact with the Armorican sandstone, and sometimes as far as 40 metres from that contact. On the other hand, towards the south, between Alencon and Bagnoles, five iron bearing horizons occur over the entire range of similar trilobitic schists. The most important of these is on the summit of Bagnoles, close to the contact with the "May" sandstone, an identical horizon being met with in the Sees ore field. The thickness and profile of any one seam are fairly constant on the same synclinal slope, but vary apparently from one slope to another, or from one syncline to another, as though, according to Mr. Barrois, the original deposit had been formed at considerable distances apart, and had been brought together by folding. The dip is always considerable—30 to 85 degrees. The ore is in a condition of oolitic carbonate or of hematite, either alone or intermingled, and both passing wholly to the condition of carbonate at varying depths.

The Normandy hematites are chiefly produced, at present, at St. Remy, St. Andre and at May. Those of Remy are the finest known, from the point of view of their iron contents: 52 to 55 per cent. of iron, 10 to 12 per cent. of silica, 3 per cent. of aluminum, 2.5 per cent. of lime and magnesia, 0.6 to 0.7 per cent. of phosphorus and 3 per cent. of water. At St. Andre and at May the iron percentage is, generally speaking, 46 to 51, with 14 to 16 per cent. of silica and 0.6 to 0.7 per cent. of phosphorus, the remaining constituents being present in the same proportions as in the St. Remy ores. The rest of the concessions yield chiefly carbonates, which are calcined before transportation, the calcination being carried out in kilns with a consumption of 12 to 15 kilogrammes of lean coal per ton of raw ore. The yield on calcination varies, at La Ferriere, Halouze and Larchamp between 75 and 79 per cent. and the calcined ore of these mines contains, finally, 48 to 50 per cent. of iron, 13 to 14 per cent. of silica, 4 to 7 per cent. of alumina, 3.5 to 4.5 per cent. of lime and magnesia, and invariably, 0.6 to 0.7 per cent. of phosphorus. Other mines do not yield such rich ores; at Soumont the ore contains 44 per cent. of iron, and 20 to 22 per cent. of silica. At Mortain, Bourberouze and Jurques, the ores range about the same. Although the ores are,







numerous portions as yet incompletely known, but the exploratory work carried out recently, and still being carried out on the various synclines, has lead to the recognition of fresh mineralized areas, in continuity with the earlier concessions, while, except at St. Remy (where it appears to have been approached), the bottom of the formation has nowhere as yet been encountered. Confining oneself to the known deposits, and basing the estimates (except for St. Remy) on the 400 metre bore-hole at Soumont, there would be 220,000,000 tons. If, as some believe, the synclines do not meet, as a general rule, before a depth of 1,200 metres or more is attained, it may be that these tonnages will be very greatly exceeded.

#### Anjou and Brittany Iron Deposits.

If the resources of the Normandy deposits are difficult to estimate, it would be even more premature to make any definite statement with regard to the Angevin-Breton deposit.

From a geological point of view, this deposit presents considerable analogy with the former; the series of south-east to north-west synclines containing several seams of ore of variable number and thickness, which are found interstratified in the Silurian, and sometimes in the Cambrian formations. Up to the present time work on the concessions granted in the extreme south-east near Angers and Segre has not progressed beyond the phase of trial borings. Numerous investigations carried out to the west beyond Chateaubriant have done little more than skim the formation while the ore bodies and rocks scattered about the Loire Inferieure, Ille-et-Vilaine, and Marbihan have not always led to the discovery of the original sources whence they are derived. The nine concessions near Angers and Segre, as yet the only ones made on a deposit of exceedingly large area, cover 10,996 hectares. The production, which was but small during 1881-1883, and again from 1889 to 1892, was only seriously recommenced at the beginning of 1907. Prior to this date only 35,455 tons had been obtained in all. At the present day, the annual production exceeds 700,000 tons, and is according to the owners, rapidly growing.

The ores, part of which are used at works in the Lower-Loire at Trignac, are also partly exported to England and Germany. They consist of oolitic iron ore, hematite or magnetite, either intermixed or separate, the color varying from dark grey to yellowish red, and the percentage of iron attaining at times 61, but usually amounting to 52 to 55 per cent. They are highly siliceous, and contain for the most part from 13 to 20 per cent. of silica. They are slightly calcareous (1 per cent. lime), slightly clayey (2 to 4 per cent. alumina), and contain a proportion of phosphorus which varies from 0.6 to 0.7 per cent. With regard to the two most important elements, iron and silica, the percentages given in the official report to the Bureau of Mines in 1912 were as follows: Oudon (where two seams of magnetite of 1.20 to 4 and 5 metres in thickness respectively were worked) 48 to 50 per cent. of iron and 15 to 17 per cent. of silica; La Ferriere (a seam of magnetite from 3 to 4½ metres in thickness) 48 per cent. of iron and 18 per cent. of silica; and Pavillon (two seams of magnetite of 1.20 and 2.10 metres in thickness) 52 per cent. of iron and 12 per cent. of silica.

In 1913 Saint-Nazaire and Nantes, which ship almost the whole of the ores exported from Anjou and Brittany, loaded 138,151 and 135,423 tons respectively.

Taken as a whole, the Normandy-Anjou-Brittany ore field yields annually over a million tons of ore. Of this tonnage nearly two-thirds is exported, the ore

having a fair percentage of iron, but, on the other hand, being somewhat siliceous and moderately phosphoric. The favorable situation of the field in respect to the ports of embarkation, and the ease with which colliers can transport the ore at cheap freights, should lead to a rapid increase in the trade with Great Britain, particularly with the impending development of mining in the various districts.

#### French Lorraine Iron Deposits.

Although a later arrival in the British market, the French Lorraine ore field, which commenced its exports in 1912 with 28,014 tons (which rose in 1913 to 69,224 tons), may easily become, in the near future, one of the largest contributors of iron ore to the United Kingdom. No doubt the mines are in a less favorable condition from the point of view of transport facilities than those of Normandy, seeing that Homecourt, the centre of the ore field, is about 400 kilometres by rail from the harbor of Dunkerque and that no other navigable waterway exists which can at present replace this method of transport, at least so far as the portion of the ore field in the vicinity of Briey, from which alone exports to England are possible, is concerned. Schemes have from time to time been put forward for many years past of a "north-east" canal, which by connecting up with the already existing canals, would allow of the ores from the northern region of the department of Meurthe-et-Moselle being transported under the most favorable freightage conditions to the port of embarkation. The realization of such a scheme would appear, however, to be very far off, and it could only be by means of special tariffs on the railway, by the use of automatically unloading wagons of large tonnage, and by the improvement of the methods of loading that this serious difficulty could be surmounted. The problem might, however, be connected with the converse problem of the importation of British coal and coke into Meurthe-et-Moselle, which would supply the special wagons with a valuable return freight and would facilitate the obtaining of important concessions, just as the colliers loading up at Dunkerque would find in the iron ore an excellent cargo.

We have hitherto spoken only of Dunkerque as the harbor for the shipment of the Lorraine ores to Great Britain, but there are other harbors which would be equally interested in the trade. So far as distance is concerned, Calais is in a somewhat similar position. In Belgium, Antwerp, Ghent and Bruges, particularly the two latter, which are endeavoring to develop their trade, would have to be taken into consideration, and have already, as a matter of fact, made some shipments to the United Kingdom. These shipments have indeed already led to a highly interesting degree of competition between the different French and Belgian harbors, and it may be that, as the outcome of this competition, a very favorable future may be secured for shipments to England.

What are these Lorraine ores, and what, more particularly, are the Briey ores? They belong to the great metalliferous formation which has been found on French territory and in the annexed portion of Lorraine, in Luxemburg, and, incidentally, in Belgium. The production of iron ore from this formation corresponded in 1912 to 28 per cent. of the world's production. The only ore field which exceeded it was that of Lake Superior in the United States, which contributed a slightly higher proportion, namely, 29.8 per cent. Of the three principal producing countries on this Lorraine ore field, France is in process of becoming the



most important; whereas in 1905 Luxemburg yielded 6,596,000 tons, the annexed portion of Lorraine 11,968,000, and France 7,395,000, the outputs for 1912, the latest year for which official statistics have appeared, were 6,553,900, 20,050,200 and 17,379,900 tons. This reveals stagnation so far as Luxemburg is concerned, but for the annexed portion of Lorraine an increase equal to 67.5 per cent., and for France an increase of 134.9 per cent. The French progress was maintained in 1913, the provisional figures showing an extraction of 19,928,000 tons, or 169.4 per cent. more than that of 1905, while the annexed portion of Lorraine will attain only 21,136,000, or 76.6 per cent.

This large increase in the French Lorraine ore production relates almost exclusively to the opening up in 1894 of the new ore field of Briey, discovered a few years before as the result of systematic trial borings, starting from the new Franco-German frontier between Batilly and Audun-le-Roman and proceeding regularly westwards to the borders of the department of the Meuse and even a little beyond. The new ore field, with its rich calcareous ores, not only enables the French iron industry, which up to then had been supplied chiefly with the siliceous ores of the original ore fields formerly discovered around Longwy and Nancy, to free itself of the necessity of importing heavy tonnage of calcareous ores from Luxemburg and from the ore fields of annexed Lorraine, but also allows the mining industry to assume a leading part in supplying the markets formerly supplied from these latter sources. Belgium has become practically dependent on the new supply! Luxemburg, met by the competition of these ores, finds her production stationary despite the installation of large works; annexed Lorraine is seeking foreign markets for her own ores, and the Sarre and Westphalian districts are depending more and more upon supplies from Briey, while everything leads to the hope that this situation will develop still more strongly in the future.

A few figures relating to the last few years will better serve to show the important position the Lorraine ore outputs, more particularly the Briey ore field, occupy in relation to the ore supply of France as a whole.

In 1894 the total French production was 3,772,000 tons, Meurthe-et-Moselle contributing 3,062 tons, or 81.1 per cent. of the total, but the Briey field only producing 9,000 tons, or 0.3 per cent. Ten years later the total French production had nearly doubled, and was 7,023,000 tons, the Meurthe-et-Moselle contribution being 5,954,000 tons, or 84.7 per cent., and the output of the Briey ore field having risen to 1,647,000 tons, or 27.6 per cent. In 1907, when the total production had reached 10,008,000 tons, Briey was producing 4,167,000 tons, or 47.2 per cent., and in the following year attained to 52.1 per cent. in a total of 10,057,000 tons. In 1912 the total production of iron ore in France was 19,160,000 tons, 90.7 per cent. of which was produced in Meurthe-et-Moselle (17,371,000 tons), while the proportion contributed by Briey was 73.1 per cent., or 12,699,000 tons. Last year the Meurthe-et-Moselle output was 19,928,000 tons, and the Briey output 15,107,000 tons, or 75.8 per cent. of the total. Of this quantity 4,416,000 tons were exported to Belgium, 2,609,000 tons to countries in the German Customs Union, and only 69,000 tons to Great Britain. The rest was consumed by French works. Thus France has, owing to this new ore field, become one of the great iron ore exporting countries, and the balance, which for many years was on the wrong side, so far as exports of ore

were concerned, is now well on the right side. Thus in 1912 there were exported 8,324,000 tons of ore, or 4.34 per cent. of the total production, while the imports only amounted to 1,454,000 tons. Last year the imports fell still lower, they having amounted only to 1,417,000 tons, while the exports rose to 9,746,000 tons.

**Geographical position.**—The French Lorraine ore field comprises at the present time (June, 1914) 68,356 hectares of concessions distributed among 114 claims. Some thousands of hectares appear still concedable in the siliceous district of La Crusnes, or beneath the forest of Haye, amounting from 72,000 to 75,000 hectares of the iron-bearing zone. In the annexed province of Lorraine the available surface amounts only to about 43,000 hectares, while that in Luxemburg is 3,600 hectares. The total area of the minette deposits is therefore some 120,000 hectares (296,540 acres).

From a geographical point of view the French area can be divided into two portions, one to the south of Nancy with 18,000 hectares of concessions, while the other, sharply separated from the former by a sterile zone, situated between Dielouard and Mars-la-Tour, extends to the west of the frontier over the department of Meurthe-et-Moselle, and partly over the department of the Meuse. The recognized available industrial area of this second part with its three subsidiary ore fields of Longwy, La Crusnes and Briey, is practically defined by the districts of Jouaville, Bruville, Brainville, Conflans, Ozerailles, Anoux, Norroy-le-Sec, Eton, Domprix, Xivry-Circourt, Baslieux, Harcourt, Lexy and Gorey.

The iron-bearing horizon recurs a long distance away, towards the west, but under unworkable conditions, as has been shown by the borings made near Etain and Verdun. At the last-named place in particular, the formation has been ascertained to occur at a depth of 580 metres.

**Geology of Lorraine iron deposits.**—From a geological point of view the minette deposits are a portion of the deposit of the great Parisian bowl, bounded on the north-east by the primary rocks of the Ardennes, the Eifel, and the Vosges. In beaches roughly concentric in shape and distributed over the whole area of this bowl, beds of various ages outcrop, becoming of more and more recent formation the nearer Paris is approached. In the Meurthe-et-Moselle these beds belong to the Callovian, Bathovian and Toarcian systems, and it is in the latter that ferruginous formation occurs, with a fairly uniform dip towards the west of 10 to 15 millimetres per metre.

The iron-bearing formation comprises a certain number of seams, which do not, however, occur throughout the formation, and the distribution of which varies, in the opinion of geologists, in the different levels. In France they are ordinarily arranged in three groups and the complete formation from foot-wall to roof comprises the upper stratum with the ferruginous chalks and the seam of red ore; the middle stratum with the yellow and grey seams; and the lower stratum with the brown, black and green seams. The foot-wall of the mineralized zone, which is always well defined, is composed of sandy and pyritic green marl, and the roof of micaceous bajocian marls; the vertical thickness as thus defined varies considerably at different points, pinching out as the boundaries of the deposits are approached, and varying on the average between 25 and 50 metres, except in the Nancy ore field, where it is thinner, and varies between 6 and 10 metres. The different seams are not, generally speaking, sharply separated from the surrounding country



rock. There is a gradual transition from the mineralized to the sterile rock, although in some instances they are sharply separated, as in the sub-basin of Landres, where the grey seam has a hanging wall composed of a special type of shell-bearing chalk.

**The Ores.**—The ore is hydrated hematite. It is oolitic, that is to say, it is composed of a number of small round grains or oolites formed in concentric layers and of variable dimensions, so that the grain is sometimes only visible under the microscope, while others attain to the size of a pinhead or of a grain of millet seed. The binding material between the grains is clayey or calcareous. The ore is much more resistant to crushing in proportion as the percentage of lime becomes higher.

In some regions, and more particularly in the grey seam, the chalk is concentrated in lumps, or rather in flattened lenses, forming nodules naturally lower in iron, which can be screened off when present in too large proportion. The color of the ore varies from dull yellow to grey, red, green and blue-black. Iron pyrites are met with throughout the deposits, particularly in the brown, green or black seams. Generally speaking, it does not give any trouble.

The characteristic element is the phosphorus, which for many years hindered the progress of production, but which nowadays constitutes one of the most valuable qualities of the mineral. The ratio of phosphorus to iron is always such that typical grades of basic iron containing 1.7 to 1.9 per cent. of phosphorus can be obtained direct, and with such regularity that it is never necessary to make routine analyses for phosphorus at the works using the ores.

The amount of iron seldom exceeds 42 per cent. in the ore dried at 110 degrees C., and is generally between 33 and 40 per cent. in the zones worked. It falls to below 30 per cent. in some ferruginous limestones employed as fluxes, and in some parts of Nancy basin, whereas in others and, generally speaking, in Briey, it ordinarily runs between 36 and 40 per cent. The composition is not always uniform within the same seam. A section often reveals several bands of varying percentages in juxtaposition.

The ore contains moisture and carbonates, hence there is an appreciable loss on drying and roasting. This loss is 8 to 12 per cent. at 110 degrees, and 14 to 24 per cent. at red heat. Attempts have been made to enrich the ores intended for transport to distant destinations by roasting, but the resulting product, although frequently attaining, and sometimes exceeding, 50 per cent. of iron, is exceedingly hygroscopic and easily falls to pieces.

**Methods of Working in the Briey Ore Field.**—Few mining districts have been opened up so rapidly as the Briey ore field; not but that there were numerous difficulties to overcome. The grey seam and the other seams (when they occur) can only be reached by shafts, and inflows of water amounting to five cubic metres were met with in several cases of sinking.

Some shafts, such as those first sunk on the Joeuf and Homecourt concessions, had even to be abandoned, permanently or temporarily, owing to the inadequacy of the provision made for unwatering. Shaft sinking by freezing, and by cementation, was practised at Auboué, Saint-Pierremont, Giraumont, but generally it was necessary to remain content with powerful suction pumps or suspended steam or electrical pumps.

The depths of the shafts increase in each ore field from east to west owing to the dip of the strata. Thus, in the Orne field the shafts are 61 and 69 metres in

depth at Joeuf, 73 and 114 at the two Homecourt pits, 90 metres at Moutiers, 120 at Auboué, 165 at Valleroy and 207 to 212 metres at Jarny and Droitaumont. In the Landres ore field they are 192 metres deep at Murville, 223 at Landres, 220 at Pienne, 235 at la Mourière, 225 at Joudreville and 245 at Amermont. In the Tucquegnieux ore field the shaft at Saint-Pierremont is 179 metres in depth, at Andernay 204 metres in depth, and at Sancy and Tucquegnieux 240 metres.

If shaft sinking has often been a matter of difficulty owing to the inflow of water, actual working has been no less difficult, and in some of the mines of annexed Lorraine as much as 30 cubic metres per minute has had to be dealt with, necessitating the installation of powerful pumping stations. Besides this, although no mine so far succeeds in extracting its full proportion of ore from the pillars, and some have not even yet progressed beyond the phase of making crosscuts, Auboué has already experienced an inflow of over 13 cubic metres per minute, Landres a flow of 6 to 11 cubic metres, Jarnby 6 cubic metres, and Murville 5 cubic metres.

At the most of the mines there have therefore been powerful underground pumps installed capable of pumping 40 to 50 cubic metres of water per minute. As a further consequence, and in order to reduce as far as possible the influence of the cost of mining on the selling price, it is necessary to make huge outputs, a necessity which is inculcated by other considerations.

Labor being already scarce in the Lorraine district when the new mines of Briey were opened, recourse was had to foreign labor, chiefly Italian, and it became more and more necessary to have recourse to such labor the further the deposits were opened up. The installation of pits in a district which was essentially an agricultural one, necessitated at the same time the creation of large workmen's colonies in the vicinity of the pits. Thus, in 1912, whereas the ore mines in the Nancy and Longwy ore fields only provided housing accommodation for 5.2 and 28.4 per cent. of their workmen, the proportion in the Briey district rose to 62.8 per cent. All this increased the capital cost of the undertakings. Therefore taking into consideration the high wages of the miners and the low cost of the products obtained, very heavy outputs must be made to pay the dividends on, and redeem the capital sunk. Some of the mines are equipped for outputs of upwards of 2,000,000 tons yearly, and the Auboué mine anticipates an output of 3,000,000, while almost all the mines can easily exceed 1,000,000. Hence outlays of 10 to 15 millions of francs (\$2,400,000 to \$3,000,000) are not uncommon for mines fully equipped with their surrounding land, their two concrete lined shafts and their workmen's colonies.

**Resources of the French Lorraine Ore Field.**—Recapitulating the estimates for the different ore fields, it may be seen that reserve remaining at the end of 1913 is 200 millions of tons for the Nancy ore field, 275 millions of tons for the Longwy field, 2,000 millions of tons for the Briey field, and for the Crusnes ore field 500 millions of tons, or a total of nearly 3,000 millions of tons. According to another estimate, made by Mr. Leprince Ringuet, chief mining engineer at Nancy, there was on January 1, 1913, in the concessions then granted, 254,000,000 tons in the Longwy ore field, 177,000,000 tons in the Nancy ore field and 2,389,000,000 tons in the Briey-Crusnes ore field, making a total of 2,820,000,000 tons. The other portions of the ore field contain, according to Dondelinger, chief of the staff of the Luxemburg mines, 250,000,000 tons in Luxemburg,



and 1,750,000,000 in annexed Lorraine (the estimate of Mr. Kohlmann, staff engineer at the Thionville mines). We thus get a total for the whole of the Lorraine deposits of nearly 5,000,000,000 tons, of which France possesses 60 per cent. This total becomes reduced to 4,500,000,000 tons by leaving the less well known Crusnes ore field out of consideration, in which case the proportion owned by France will be about 56 per cent.

Up to 1912 there had been mined an aggregate of 583,163,000 tons, which is further increased to about 631,000,000 tons by the addition of provisional estimates relating to the output during 1913.

In the foregoing estimates there have not been included the Belgian portions of the deposit, now of greatly diminished importance and almost exhausted, from which, since 1832, some 4,000,000 tons have been extracted, nor the tonnages mined prior to 1860, or between that year and 1868, which may be estimated at 8,000,000 tons, derived mainly from detached portions of the ore field.

On the 1st of January, 1914, therefore, approximately 650,000,000 tons may be regarded as having been mined in Lorraine, or a little over one-eighth of what still remains.

The foregoing figures show the large tonnages which still remain in reserve in the French Lorraine ore basin. As has already been said, the primary ore field of Briey, which is the most considerable, is the only one from which exports to Great Britain would be feasible, and such exports have already commenced. The Longwy and Nancy ore fields do not, as a matter of fact, contain sufficient reserve to enable even the local works greatly to increase their outputs, besides which their more highly siliceous and friable ores containing, as they do, less iron, are less suitable for shipments to distant destinations.

### EXPRESS CO. RAISES RATES.

Cobalt, Oct. 5.

The insurance rates upon bullion for trans-Atlantic shipment have been boosted to double their previous figure, but at the moment it is not possible to give the exact figures.

The local express companies and the mines are without details on this most important point, but it is expected that definite information will be forthcoming within a few days.

The old rate, which was fixed under a twelve months agreement, and which covered all risks, expired on Wednesday last, and the express companies, having in mind the extra risks attached to the Atlantic passage are reported to have doubled the rate. The great European war is, of course, the reason for the hoist.

There was only one shipment of bullion from the camp last week, the O'Brien sending out 26 bars on Thursday. Eleven cars of ore left the Northern mining field during the week, of which nine came from Cobalt and one each from the Casey Cobalt and the Tough Oakes. La Rose headed the local tonnage, with Coniagas strong on the list.

The ore shipments for the week were as follows: Coniagas, 165,010 lb.; La Rose, 166,070; McKinley, 87,570; Nipissing, 86,580; Townsite, 87,700; City of Cobalt, 87,730; Casey Cobalt, 40 529. Total, 721,189 lb. Gold ore from Swastika, Tough-Oakes, 60,560. The local bullion shipments for the week were O'Brien, 26 bars, 26,614 oz.; value, \$14,105.

### KERR LAKE MINING.

Kerr Lake Mining Co. operated at a profit of \$620,786, during its fiscal year ended August 31, according to the report presented at the annual stockholders' meeting. Previous year's profit amounted to \$769,176.

Silver yield totalled 1,828,424 oz., against 1,855,495 oz. The average cost of production was 24.86 cents an oz., comparing with 18.30 cents in the preceding year. The cost was apportioned as follows (cents an oz.):

	1914.	1913.
Mining and development ....	12.49	12.10
Shipment and treatment .....	11.61	5.55
Administration. . . . .	0.76	0.65
Total. . . . .	24.86	18.30

Manager Robert Livermore places ore reserves at 5,698,700, against his estimate of 6,660,091 tons at the end of the 1913 period. Mr. Livermore states that his estimate has been kept purposely low because of difficulty in getting accurate results in the very variable ground which furnishes mill rock. It is safe to say, he adds, that the present estimate will be exceeded.

Of the total production, 1,828,424 oz., 1,196,401 oz. came from shipping ore and 632,023 oz. from low grade milling ores. Development work slightly exceeds last year's rate, the total being 5,399 ft., against 4,984 ft. Discoveries included new veins and extensions to known ore bodies.

The Kerr Lake Co. of New York, the holding company, received from the operating company in dividends, \$614,000, and disbursed to stockholders \$600,000.

Operating and profit and loss account of Kerr Lake (operating company) shows:

	1914.	1913.
Proceeds sale ore .....	\$1,036,952	\$1,028,343
Net proceeds sale ore .....	952,144	1,034,881
Interest. . . . .	23,743	9,536
Production shipment admin. charges. . . . .	355,101	275,242
Balance profit .....	620,786	769,176

Balance sheet shows cash of \$93,333 short term bonds, \$256,598; call loans secured, \$350,000; ore sold but unsettled for, \$108,180; surplus August 31 was \$961,094, against \$716,993 at end of preceding year. The holding company had a profit and loss balance of \$98,597.

At the annual meeting the retiring directors were re-elected.

### MARQUETTE IRON RANGE.

The cut in the mining forces on this range, which was bound to take place this fall, came on October 1, when three of the operators closed mines or reduced the working hours. About 500 men were thrown out of employment and several hundred more will only be employed four days a week.

In addition to reducing its working force, the Cleveland-Cliffs Iron company, the largest employer of labor on the range, announced a cut in wages of 10 per cent, to take effect October 1. The order applies to every person in the employ of the company, from the president down. The following announcement was posted at all of the company's mines and offices. "We regret to announce that, owing to the extreme depression in the iron business brought on largely by the European war, it is necessary to make a 10 per cent reduction in wages to take effect October 1, 1914."



# CENTRIFUGAL COMPRESSORS

By Louis C. Loewenstein.\*

The rapid substitution of rotating for reciprocating machinery has been one of the most striking engineering developments of recent years. The marked success of the steam turbine no doubt stimulated the development and introduction of the centrifugal pump and more recently the centrifugal compressor. The centrifugal compressor to-day stands in the same relation to other compressors as the steam turbine stood fifteen years ago to the reciprocating engine, or as the centrifugal pump stood five years ago to other pumping apparatus. Although the initial development of the centrifugal compressor was first begun in Europe, the General Electric Co. started about three or four years ago to develop and introduce it in America; and the marked success attained is well substantiated by the large number of successful units in commercial operation.

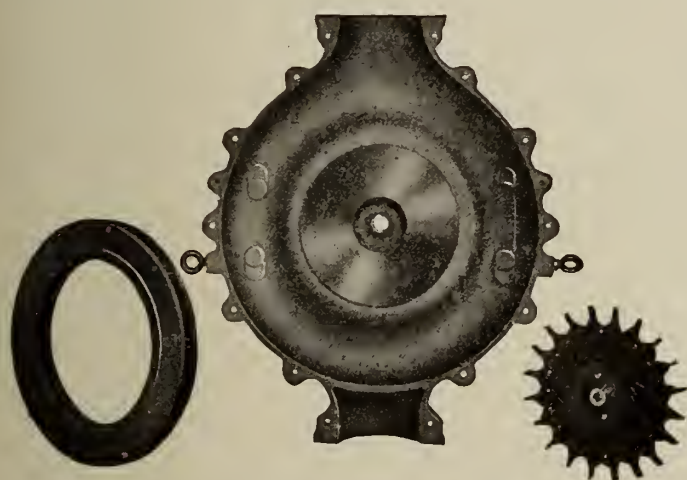


Fig. 1. Impeller, discharge vanes, and half casing of Single Stage Compressor

A centrifugal compressor resembles a centrifugal pump, except that in the former elastic fluids are compressed and in the latter fluids comparatively inelastic are pumped. A centrifugal compressor consists of a revolving impeller mounted on a shaft supported in suitable bearings and surrounded by a stationary set of discharge vanes supported in a suitable casing. If the desired amount of compression is small, a single impeller suffices and the apparatus is known as a single stage compressor; if the compression desired is larger a multi-stage compressor is used, which consists of two or more single stage units mounted on the same shaft and operating in series within a common casing.

As the name centrifugal compressor indicates, centrifugal force plays an important part in its operation. When set revolving, the impeller will, by centrifugal force, entrain a fluid, say air, at its inner circumference and will discharge it at its outer circumference at an increased pressure. This pressure can be called centrifugal pressure. Besides this the impeller has set the air into motion; and at its outer circumference, or discharge end of the impeller, the air is moving at practically the same velocity as the peripheral speed of the impeller. Hence the work delivered by the driver to the impeller of the centrifugal compressor appears in the air discharged from the impeller in two forms of energy, pressure energy and

velocity energy. It is the function of the stationary set of discharge vanes to convert the velocity energy into pressure energy. The discharge vanes are so designed that the air in flowing through the passages between the vanes is gradually reduced in speed and the velocity energy recovered in the form of an increase of pressure energy. Roughly speaking, about 95 per cent. of the energy supplied by the driver to the compressor appears as pressure energy and velocity energy in the air leaving the rotating impeller. About one-half of the available energy is in the form of centrifugal pressure, while the other half is in the form of velocity. In an ordinary fan or blower this high velocity of the air is allowed to dissipate itself chiefly into eddy currents, and finally exists in the air in the form of heat. In the centrifugal compressor this velocity energy is largely recovered in the form of increased pressure. Hence the vital difference between an ordinary fan or blower and a centrifugal compressor lies in the fact that the former does not recover any of the velocity energy generated by the rotating impeller, whereas the latter recovers the larger part of the velocity energy so produced. It can be readily seen why the centrifugal compressor is so highly efficient and why this recent type of air compressor is replacing all older types.

Besides its high efficiency there are other advantages which aided in the introduction of the centrifugal compressor. On account of its operating at high speeds this compressor is much smaller in size than any other compressor delivering the same work; and further, because it can run at high speeds it can be direct connected to high speed drivers, which are in themselves smaller and more efficient than those which must operate at low speeds. This is especially true of the steam turbine, and a turbine driven centrifugal compressor forms an ideal arrangement. Ample clearances can be provided about the impeller, and if the bearings are properly designed and provided with efficient lubrication, no rubbing parts exists; so that the original efficiency of the unit is maintained after years of service. Compare this to the performance of displacement or positive pressure blowers where frequent renewals are necessary to maintain somewhere near the original efficiency and output; or compare this compressor to the inefficient and large fans or blowers, and it then does not seem strange that the centrifugal compressor has made such great strides commercially and is supplanting other forms of compressors in almost all fields of service.

The efficiency of centrifugal compressors will be steadily improved as we gain more theoretical knowledge of the laws governing air flow, but the fundamental principles involved are well understood and are quite simple. Fig. 2 represents diagrammatically a centrifugal compressor. The air particles enter the impeller at a Diameter  $D_c$  and leave it at a greater diameter  $D_a$ . The impeller is rotated by a motor at an angular velocity  $\omega$ ; the air particles are thrown outward by centrifugal force and thus exert a pressure which can be expressed by the equation

$$\left(\frac{D_a}{2}\right)^2 - \left(\frac{D_c}{2}\right)^2 \omega^2 = \frac{u_a^2 - u_c^2}{2g} = \frac{p}{\rho} \quad (1)$$

\*Engineer, Turbine Department, General Electric Company.



in which  $u_a$  and  $u_e$ , Fig 2a, represent the peripheral velocities at the diameters  $D_a$  and  $D_e$  respectively;  $p$  the pressure rise; and  $r$  the density of the air.

Air enters the impeller in a radial direction. If the air is not to enter the impeller radially some sort of guide vanes should be provided to properly direct the air; but if the air is to enter radially, only radial ribs are provided to prevent churning of the air before entrance to the impeller. In high speed impellers the blades of the impellers are radial at exit. If they

lost in the form of heat. Hence the centrifugal compressor, which recovers the larger part of this velocity energy in the form of pressure, must necessarily be much more efficient than the ordinary fan or blower. A good practical dividing line between the field of usefulness of ordinary fans and centrifugal compressors may be said to be at about  $\frac{3}{4}$  lb. pressure. This dividing line, however, is not a sharp distinction, as in some cases it is advisable to use a centrifugal compressor even for a pressure of half a pound, while

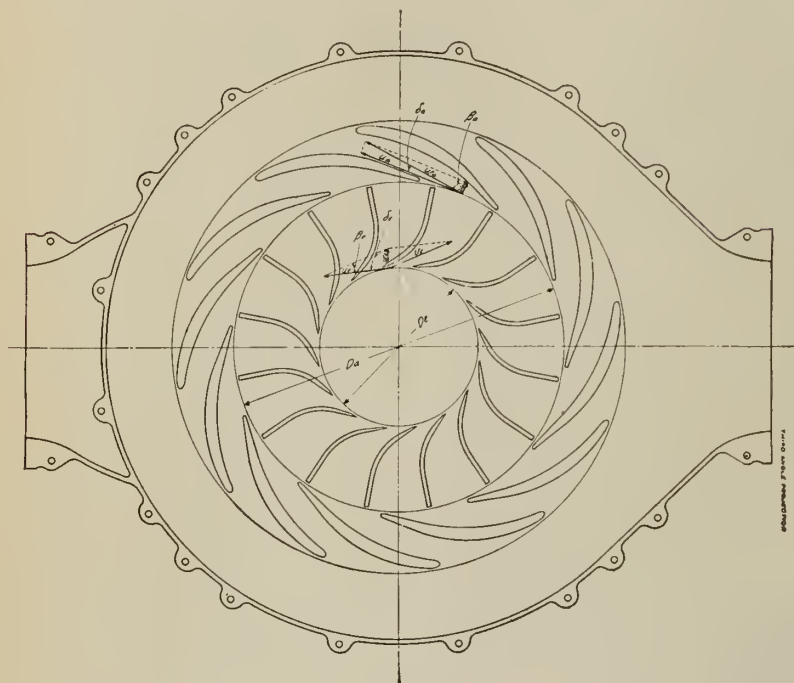


Fig. 2. Centrifugal Compressor shown diagrammatically

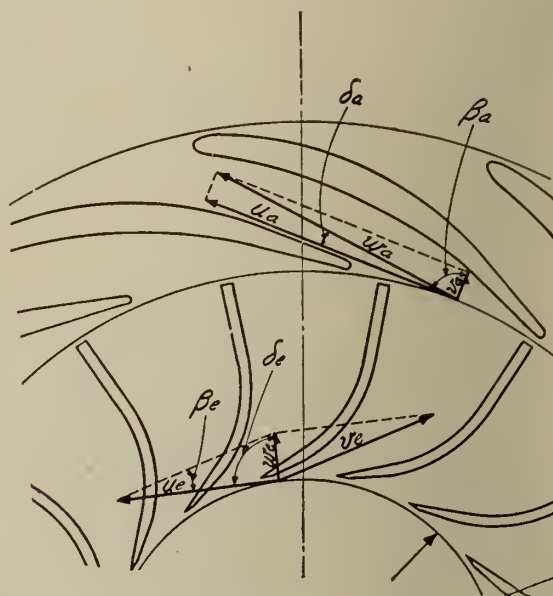


Fig. 2a

are not radial, great care must be exercised in designing them so that the ensuing centrifugal forces exerted on the blades do not bend or break them.

The actual efficiencies of single stage air compressors vary somewhat with the capacity of the unit, but generally speaking the shaft efficiency is usually over 70 per cent. and the hydraulic efficiency is usually over 75 per cent. The shaft efficiency is the ratio of the theoretical power required to compress a given volume of air to a given pressure to the actual power which must be applied to the shaft of the compressor. The hydraulic efficiency is the ratio of that same theoretical power to the power represented by the fluid input. The hydraulic efficiency does not include any rotation losses or short circuit losses, but includes losses along impeller blades and along the discharge vanes.

Centrifugal compressors can be used wherever any compressible fluid is to be compressed or pumped. The various forms of compressing apparatus, besides centrifugal compressors, may be classified as follows: fans or blowers; positive pressure blowers; and reciprocating compressors.

Fans or blowers, such as are shown diagrammatically in Fig. 4, are chiefly used when the desired compression is very small and where efficiency is of less importance than first cost. It has already been shown that the ordinary fan or blower delivers simply a pressure approximately equal to the centrifugal pressure generated by the revolving impeller or runner. The velocity energy existing in the air at impeller exit is

in other cases, when efficiency plays no important part whatever, fans and blowers can be used to give pressures of almost a pound.

Positive pressure blowers are machines in which the rotating part consists of one or more drums with lobes running with close clearances to the casing, as is shown in Fig. 5. These lobes form pockets in which the air or gas is pocketed on the intake side of the compressor and carried in this pocket over to the outlet side of the compressor. If there is no resistance on the outlet or discharge end, the air is simply moved from inlet to outlet. If, however, a higher pressure exists at the discharge end, then the air delivered will be raised to the pressure of air existing on the discharge side. In other words, these machines are pure displacement machines and displace at every revolution a certain volume of air.

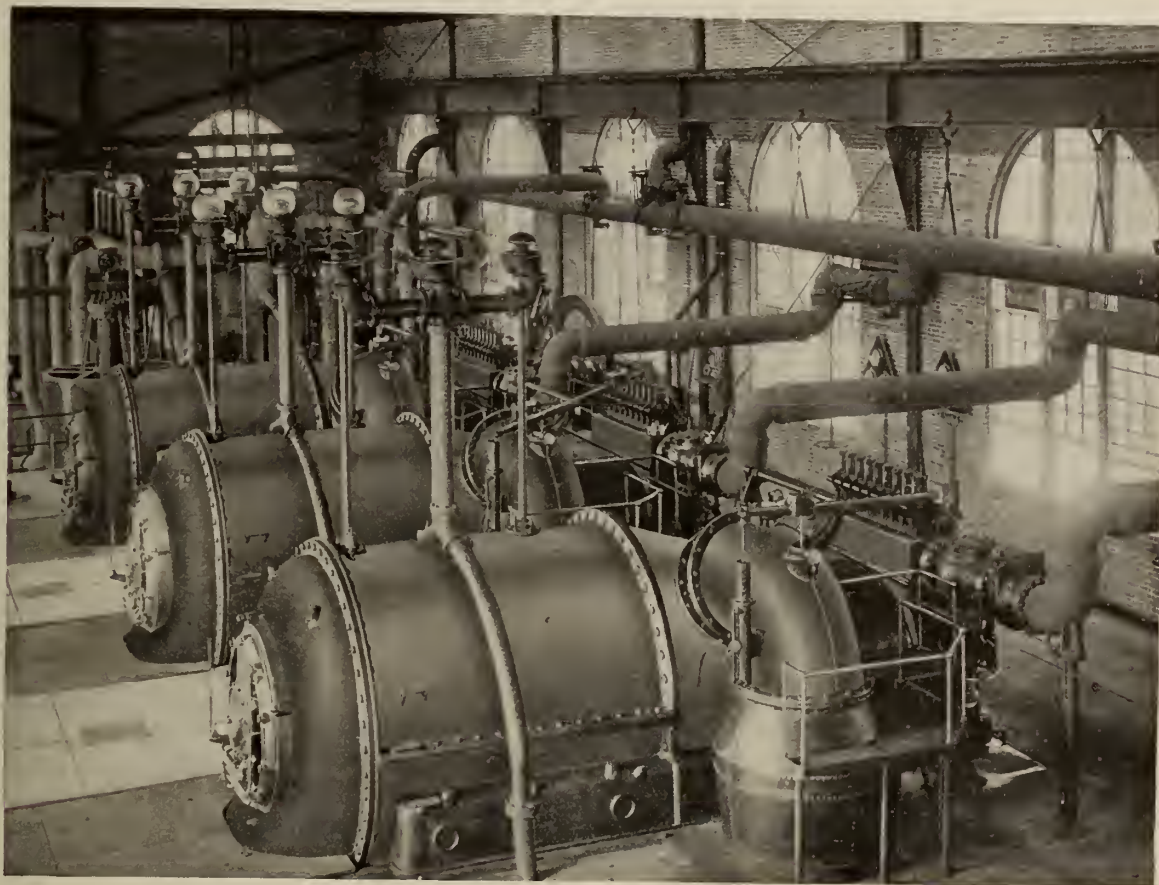
Reciprocating compressors are efficiently used when the desired pressure is 15 lb. per square inch or higher. There is a great deal of difference in design between various makes of reciprocating compressors which influence the commercial efficiency of this type greatly. The rating of reciprocating compressors (and also positive pressure blowers) is usually expressed in displacement air, that is, the volume swept through per minute by the reciprocating compressor piston. This displacement air is about 15 to 20 per cent. higher than the actual air delivered by the compressor. This can be easily understood if we remember that in a reciprocating compressor the pressure in the clearance spaces be-



tween the piston and the cylinder and in the ports up to the discharge valve is equal to the discharged air pressure when the piston reaches the end of its stroke. When the piston returns the air in the clearance space must expand to atmospheric pressure before any air from the atmosphere can be drawn into the cylinder; hence only part of the volume swept through by the piston represents air admitted to the cylinder, and the actual air delivered is usually less than the displacement of the reciprocating piston. The ratio between

in area. The falling off in the efficiency of the compressor after running for some time is generally due to leakages past these valves, and good attention is necessary and periodical renewals should be made in order to maintain good efficiency on reciprocating compressors.

Centrifugal compressors have the great advantages of not having any close clearance to produce wear by rubbing, and of having no valves that can leak. A centrifugal compressor will have the same efficiency



**Fig. 3. Three Type T-3-40,000-15/30-2500/3250 R.P.M. Air Compressors driven by 2900/5200 H.P. Curtis Turbines, installed at Iroquois Iron Company, So. Chicago, Ill., for blowing 500-ton blast furnace**

actual air delivered and displacement air is called volumetric efficiency.

Some designers have attempted to increase the volumetric efficiency of reciprocating compressors by increasing the velocity of the air at intake, that is, a high velocity of air is established when the piston is drawing air from the suction end. If this velocity is high enough there will be an actual compression of intake air when the piston reaches the end of its stroke and before it starts compression, due to this high velocity head. It is possible to bring the volumetric efficiency up to 100 per cent. and even above, but this is done at a sacrifice in energy efficiency, and the power loss due to establishing a high velocity of intake air more than counteracts the gain achieved by increasing the volumetric efficiency. The best that can be done is to make the clearance spaces as small as possible, and with good design the difference between displacement air and actual air delivered need not be over 12 to 15 per cent., if all valves are tight. In order to have low resistances to air flow, the intake and discharge valves of the reciprocating compressor should be large

after years of service as it had when new. Besides this there is a decided saving in the cost of operation and maintenance of the centrifugal compressor over that of a reciprocating compressor. There is a decided difference in size between a centrifugal compressor and a reciprocating compressor of the same rating, and therefore the cost of foundations is very greatly reduced when centrifugal compressors are used.

#### **PORCUPINE CROWN AND NORTH THOMPSON.**

Timmins, Ont., Oct. 3.

A consolidation of the Porcupine Crown and North Thompson properties at Timmins is under consideration. At present the Engineers of the Porcupine Crown are examining the North Thompson property, and those of the Huronian Belt Company, which is operating the North Thompson, are investigating the Crown mine. The object in each case is to ascertain whether the respective properties will warrant an amalgamation on a basis satisfactory to both parties. The two properties adjoin the Hollinger on its southern boundary.



## CHARACTERISTICS OF GOLD DEPOSITS OF KEWAGAMA LAKE DISTRICT, QUEBEC

The Geological Survey of Canada has published a report by Mr. M. E. Wilson on the geology and economic possibilities of a region in northwestern Quebec, lying immediately east of the Ontario boundary and south of the National Transcontinental Railway.

Mr. Wilson states that within the region described in this report there are no producing mines and only one property in which a mining plant has been installed. The district, however, has not been prospected except in a very superficial way, so that the fact that no important discoveries have as yet been made has little bearing on its future possibilities. The deposits which have up to the present attracted attention are the molybdenite bearing pegmatite dykes and quartz veins, and the auriferous quartz veins or veinlets in ferruginous dolomite, aplite and quartz porphyry.

**Gold.**—Practically all the rocks of the region are traversed by veins or veinlets of quartz which are more or less auriferous, but the most important by far are those occurring in the rocks of the Abitibi volcanic complex, and more especially in the ferruginous dolomite, aplite and quartz porphyry. These are believed to be genetically related to one another and will, therefore, be described in a group by themselves.

Veins or veinlets of quartz containing gold are now known to occur in the region described in this report, in the Larder Lake district, at Porcupine, and in numerous other localities throughout the northern part of the Timiskaming region. As will be shown later, there are certain features associated with these occurrences which point to a similar origin for all.

In a number of localities throughout the region, a rock consisting largely or in part of ferruginous dolomite occurs, which is cut by intersecting veinlets or veins of quartz. These veinlets and veins appear to occur in definite systems, a feature which is well developed in a ridge of the dolomite occurring on the north side of the Cascade rapids on the Kinojevis river. This ridge has a width of 100 yards and a length of one-fourth mile, and throughout its whole extent is traversed by the veinlets and veins of quartz.

The veinlets and veins occur mainly in two systems which strike approximately at right angles to one another, and are inclined at about 45 degrees to the trend of the dolomitic ridge.

In the Larder Lake district, quartz veinlets traversing the dolomite are also generally inclined to the structural trend of the enclosing rock.

In the Porcupine district, according to Mr. A. G. Burrows, the strike of the gold quartz veins is generally inclined to that of the enclosing rock, and while the dip of the schist is to the north at a high angle, the veins commonly dip to the south across the schistosity.

**Origin.**—The foregoing comparative study of the distribution of the gold bearing quartz veins of the northern part of the Timiskaming region shows in a very striking manner that the fissures along which the gold bearing solutions percolated were arranged in systems having a definite discordant relationship to the structure of the enclosing rocks. The uniformity of this relationship points to a cause which operated throughout the whole region, while the inclination of the fissures at an angle of approximately 45 degrees or less to the structural trend of the enclosing rock suggests that the fracturing owes its origin to compressive

stresses acting in the same direction as the stresses which folded the rocks of the region. That such stresses were present at the time the fissures were formed is probable from the evidence that the vein filling material is derived in part at least from acidic rocks and that the intrusion of these acidic rocks accompanied the folding of the rocks of the region.

If the rocks in which the gold bearing veins of the Timiskaming region occur were fractured by compressive stresses acting in the same direction as the stresses by which they were foliated, then, in the case of an irrotational strain, if the relief of pressure were greatest in a horizontal direction at right angles to the regional stresses two systems of fissures would be developed, which, on a flat erosion surface, would cut across the trend of the enclosing rock at an angle of approximately 45 degrees, but, on a vertical surface, would appear parallel, that is the discordant relationship would be in strike. If, on the other hand, the relief of pressure were greatest in a vertical direction at right angles to the regional stresses, two systems of fissures would develop which would conform in strike to that of the enclosing rock, but would cut across the dip at an angle of approximately 45 degrees. In the case of a rotational strain two systems of fissures having a discordant relationship to the foliation would tend to form, as in the special cases just cited, but the fissures in the plane at right angles to the direction of elongation would develop by crevicing. Thus where rocks undergo fracture as a result of regional compressive stresses the fractures may indicate their mode of origin (1) by their discordant relationship to the foliation (provided the stresses act in the same direction as those by which the foliation was developed), and (2) by their occurrence in two intersecting systems. Both of these features are conspicuous in the case of the fissures along which the quartz veins occurring in the Pre-Cambrian volcanic complex of the Timiskaming region were developed.

### Character of Deposits.

Those deposits which occur in association with the ferruginous dolomite consist for the most part of innumerable small anastomosing veinlets of quartz from 1 in. to 6 in. in width. In some places these are bordered by a zone of dolomite which when dissolved away leaves the quartz with a denticulated surface. In other places the veinlets have no definite walls, the junction of the quartz and the wall rock being gradational. In such localities the country rock may be almost entirely replaced by quartz.

The larger veins occurring in these rocks of the Abitibi group are very similar in character and in form regardless of whether they occur in the ferruginous dolomite or any other member of the volcanic complex. They vary greatly in width from less than a foot to several feet in short distances, and many expand abruptly to a large mass of quartz 30 feet or more in width, such as the mass occurring in the ferruginous dolomite north of the Cascade rapids on the Kinojevis river. The essential similarity of the form of these deposits to those of the Porcupine district is shown by the following quotation from Mr. Burrows' report on that area. "The irregular fissuring has produced a great variety of quartz structures, varying from the tabular, though often irregular or lenticular, vein which may be traced several hundred feet, to mere veinlets, often only a fraction of an inch in width and a few feet in length, which ramify through a rock which has been subjected to small irregular fissuring. This latter variety is well illustrated in the fissuring of ankerite bands, so characteristic of many of the



gold deposits of Porcupine. Irregular and lenticular bodies of quartz often occur which may have a width of 10 or 20 ft., but which die away in a distance of 50 ft. Again there are dome-like masses of quartz which are elliptical or oval in surface outline, but whose underground extension has not been examined closely. . . . The most conspicuous dome masses are those of the Dome property, where the two largest are about 125 ft. by 100 ft."

The mineralogy of these deposits is comparatively simple for they consist almost entirely of milk-white quartz. Ferruginous dolomite is usually present in some abundance, but all the other mineral constituents occur in exceedingly small quantities. The most abundant of these are pyrite, chalcopyrite, galena, and gold. Mr. Burrows also notes the occurrence of zinc blende, pyrrhotite, argentite, feldspar and tourmaline in the quartz veins at Porcupine, and since the publication of his report, the silver telluride, hessite, and the calcium tungstate, scheelite, have also been reported. In the region here described tourmaline was observed in quartz veinlets in the dolomite occurring on Mackenzie lake, and chrome mica in veinlets in porphyry on the property of the Union Abitibi Mining Co., between Renault and Fortune lake. The presence of the gold telluride, petzite, in the veinlets in the porphyry on the latter property has also been described by Mr. R. Harvey.

#### GRANBY.

New York, Oct. 6.

Stockholders of the Granby Consolidated Mining, Smelting and Power Co. voted at their annual meeting here to-day to reduce the board of directors from fourteen to thirteen, and the vacancy caused by the death of George M. Luther was not filled. A bare majority of the stock was represented at the meeting, 79,531 shares, or 53 per cent. of the total, being voted.

President W. H. Nichols said that metallurgical difficulties in connection with the smelting of ores at the Anyox property had been encountered, but had been solved, and he predicted that the Anyox, in full operation, would produce at a cost as low as any mining company in the world.

"There is less copper in the world now than for some years," said Mr. Nichols, "but there is less being used. When the war clouds roll over I do not believe there will be enough metal to go around for a time."

The stockholders approved an issue of \$960,000 Series A convertible six per cent. bonds, to take care of the unsecured notes which fell due last year.

The annual report, which was submitted at the meeting in New York, compares as follows:

	1913-14.	1912-13.
Copper production (lbs.) . . . .	23,320,997	22,688,614
Gross earnings . . . . .	\$4,504,766	\$4,782,691
Net profits . . . . .	936,674	1,214,599
Profit and loss surplus . . . . .	2,606,742	3,199,270

#### McKINLEY-DARRAGH-SAVAGE.

Cobalt, Sept. 30.—A strike of prospective rather than actual importance has been made on the Savage mine, the Cart Lake property of the McKinley-Darragh-Savage Mining Co. At a distance of 450 to 500 ft. from the shaft in the direction of the diabase mountain a crosscut encountered a very rich but very short shoot of ore. At the 110-ft. level in the top of the drift the vein is calcite. At the bottom it is excellent ore. A winze will be sunk on the vein to discover if it goes down.

#### MANGANESE ORE FROM RUSSIA AND BRAZIL.

New York, Sept. 29.

Arrivals at eastern ports of about 18,000 tons of manganese ore from Russia and Brazil, which represent deliveries upon recent purchases by domestic steel makers, have been recorded during the past few days. At Baltimore, the steamers Gowanburn and Liv, with 11,000 tons of Russian ore, which was diverted to this country while afloat, has been delivered to the Pennsylvania Steel Company. This company plans to make ferro-manganese from this ore at Steelton, but has not yet announced when one of its furnaces will be put upon this manufacture. The steamer American, with 7,000 tons of ore from Brazil for the Carnegie Steel Company also has arrived at eastern ports.

Cable advices were received in this country Monday to the effect that the Russian Government had removed the embargo on manganese ore which was imposed about a month ago. The significance of this announcement is uncertain, owing to doubt whether shipments may be made from the Black Sea through the Bosphorus and the Dardanelles.

Shipments of ferro-manganese from England continue to come forward in quantity. The steamer Swanmore arrived at Baltimore in the week with about 2,000 tons. The Rapidan is now afloat with some tonnage. The market for ferro-manganese is very quiet, and sales almost entirely are lacking. English makers still are asking \$80, seaboard, and recent offers of resale lots by merchants at \$75, but with special conditions attached, do not seem seriously to have affected the market. Further small sales of domestic, 19 to 21 per cent. spiegleisen, have been made at \$31.50 at the producer's plant in Eastern Pennsylvania.

#### U. S. IRON AND STEEL TRADE.

During September about 75,000 tons of rails were ordered, 400 cars and 35 locomotives, about the same rate as in August, and the smallest monthly in 15 years. The last two weeks' orders for iron have been at the rate of less than 1,000,000 tons per year. Last year the United States produced nearly 31,000,000 tons.

The Steel Corporation is operating at about 55 per cent. Its export business is showing good signs, although actual orders are considerably below normal. Russia has been negotiating for large quantities of barbed wire with the Steel Corporation and some special sheets are understood to have been sold by Pittsburg to one of the allies.

#### COLORADO STRIKE.

Washington, Sept. 30.—Senator Thomas, who has just returned from conferences with Colorado coal operators and striking miners, told President Wilson to-day he believed the plan for settlement, already accepted by the miners but rejected in part by the operators, would have to be materially modified before the latter would agree to it.

The President does not intend to keep Federal troops in the Colorado fields indefinitely, and is pressing for a speedy adjustment.

Denver, Colo., Sept. 30.—The Colorado coal operators have refused to accept President Wilson's proposition for a three-year truce.

#### NIPISSING MINES CO.

The August net profit of Nipissing Mines Co. was \$136,778 on a yield of 401,820 oz. of silver, valued at \$212,965. With two exceptions the production was the largest this year.



# THE ELECTRIC FURNACE FOR STEEL MAKING\*

By Walter N. Craft.

At the present time the art of steel making is developed to such a point that there is no question as to the possibility of making good, and even excellent steel products for all commercial purposes at a cost which is now considered reasonable. Therefore, with the crucible, Bessemer and open hearth processes in such general use and producing steel of good quality at low costs, it will be necessary for the advocates of any new methods or processes to show some real commercial advantages of a new process, as compared with one of the older methods of steel making. So it is the author's purpose to point out some of the advantages and disadvantages of the electric steel furnace, comparing it with the old and well known processes of steel making. He wishes to say at the outset, however, that he does not think the electric furnace is a universal panacea for "all the ills that steel is heir to."

The development of electric steel making, like many other new methods and processes, is suffering from too great enthusiasm on the part of its friends. In the development of the gas engine, for instance, there was a time when the capacities of the engines, as well as their engineers, were enormously overrated, but now the ratings have settled down to a safe and sane basis, and the engineers are no longer advocating the gas engine in season and out of season regardless of conditions. In the same way, the electric furnace has suffered and claims have been made for electric steel and electric furnaces that cannot be substantiated in commercial operating conditions. So, while the author feels that there is a large field for the electric furnace, he does not feel that it is destined to displace the Bessemer or the open hearth, at least for a great many years, possibly a lifetime. It is well to remember that there was a time when such a thing as the open hearth displacing the Bessemer was hardly considered a possibility. As statements concerning what is possible and what is not possible nowadays are very unsafe, the author will avoid prediction and endeavor to present merely a few considerations, which seem to be facts, concerning electric steel and electric furnaces.

The underlying principle of all electric steel furnaces is merely that of heating and melting by the use of electric current. Alternating current is a necessity for commercial operation. So far as is known there is no chemical or electrolytic action of the current such as is the case in the reduction of aluminum or the deposition of copper. The heating of the steel is accomplished in two different ways according to the type of furnace, so that there is a natural division into arc and resistance furnaces. In describing the different furnaces briefly, as is necessary in such a paper as this, the author will be compelled to omit reference to many variations, and confine himself to the three or four types which thus far seem to have had the most general recognition and adoption in actual commercial practice in this country and Europe.

**The Stassano furnace.**—There are three best known types of arc furnaces, namely, Stassano, Girod and Heroult, all in use in Europe, and in this country. The Stassano is purely a radiation furnace. The furnace body consists of a cylinder which stands normally in a position slightly inclined from the vertical and is arranged so that it can be rotated in order thoroughly to mix the steel. The heating is done by carbon elec-

trodes which enter the furnace body on the sides and go into the centre of the furnace over the bath of steel. The electric current arcs from one electrode to another, and the heat of this arc radiates downward causing the bath of steel to melt. This furnace is adaptable to small sizes, but has not been successful in the larger units. The mechanical rotation of the entire furnace in order to obtain proper mixture of the steel is liable to introduce difficulties in operation. The size of the electrodes is also limited on account of their horizontal position and the great tendency to break if the weight becomes too great; hence the current input is limited by the size of the electrode. The current consumption is high on account of the small size of the furnaces. This furnace has the great advantage that it can use single or polyphase current of any frequency, which is not true of all furnaces.

The thermal efficiency of the Stassano furnace is fairly high, since the furnace body is entirely closed and there is a comparatively small opportunity for heat to escape through openings. It will naturally result that the refractory lining wears out quite fast and the cost for repairs is correspondingly high. The current consumption in this furnace, using cold scrap and refining to the quality of ordinary steel castings, is 800 to 1,000 kw. hours per ton of steel. In this connection it should be noted that in giving the current consumption for electric furnaces there is always opportunity for a wide variation, since the current consumption will depend upon the nature of the scrap charged, both physically and chemically, as well as upon the extent to which the refining of the steel is carried. It will be appreciated that if steel scrap is simply to be melted and poured into molds the current consumption will be much less than will be the case if the steel scrap is to be melted and then given a further refining to the analysis of high grade open hearth steel or even to the analysis of the best crucible tool steel. This consideration with regard to current consumption applies equally to all electric furnaces.

Returning to the Stassano furnace, it may be said that several of these furnaces are in use in Europe and possibly three or four have been built in this country, of which one or two have been abandoned and other furnaces substituted.

**The Girod furnace.**—The next arc furnace in point of extent of use is the Girod. This type is a combination arc and resistance furnace. There are electrodes entering through the top of the furnace and reaching to the surface of the molten bath. Arranged in the bottom lining of the furnace, directly under the bath, are iron or steel plugs, which are water cooled. The current connection from the generator is made with the top electrodes and the returning connection to the generator through the bottom electrodes, that is, one pole is above and one below, and the current arcs from the top electrode to the slag or metal of the bath and passes through the bath to the bottom plugs or electrodes. The heating thus comes in part from the arc at the surface of the metal and in part from resistance offered by the bath to the passage of the current. Probably every one who has ever had anything to do with an open hearth furnace will immediately feel an instinctive prejudice against these bottom electrodes, especially when he considers that they are water

(\*A paper written for the Cleveland Engineering Society, April, 1914.)



cooled. To an open hearth advocate a hole in the bottom is a nightmare, and if that hole is filled with molten metal with flowing water immediately below it, the nightmare is liable to change to delirium tremens. As a matter of fact, however, these plugs, when taken out at the end of a run, show signs of having been melted down only four or five inches from the top, and the superintendents in Ugine, France, where the furnaces were first put into service, say that while they have had heats go through the bottom, they have never had any explosions due to the water cooling of the plugs. It is said, however, that in the operation of this furnace there is some difficulty in the making of bottom and holding up of the plugs to the desirable bottom level. There seems to be a difference in statements concerning the wear and life of bottoms in the Girod furnace. Some say that the bottoms wear away gradually and cannot be repaired or built up, as is the case in open hearth practice, and, further, that the bottoms are built of an unusual thickness at the outset in order that there may be opportunity for this wearing away before the furnace must be shut down on account of the bottom becoming too thin. They also say that in consequence a Girod furnace may start out as a five or six ton furnace and end up as a seven or eight, or even a ten ton furnace, on account of this extreme wearing away of the hearth. Others say that there is no difficulty of this kind, and that the bottoms can be repaired and built up between heats, as much as desired. The life of these bottoms is said to be from one hundred to one hundred and twenty heats when cold stock is being melted. Putting in a new bottom requires three days. In this connection it should be mentioned that in arc furnaces the wearing on the furnace walls and the furnace roofs is much more severe than is the case with induction furnaces. In the case of the Girod furnace, the life of the roof is in such great dispute that the author prefers to make no statement concerning it more than to say that it may vary all the way from eight or ten heats up to twenty or thirty heats, and possibly in some cases longer. At the Girod plant in Ugine, France, for 1913, the charge per ton of steel for refractories and linings was \$2.00, while actual cost for the first four months of 1913 was running somewhat lower, and the management expected to be able for the year 1914 to adopt a charge for refractories and lining of \$1.60 to \$1.70. The electrode consumption is continuous, due to the wearing away of the electrode at the arc, and also to breakage. Electrode consumption runs from forty to fifty pounds per ton. The usual practice is to use amorphous carbon electrodes, which cost at Ugine, in France, about 3 cents to 3¼ cents per pound. It will thus be seen that the electrode cost per ton is from \$1.20 to \$1.65. In addition to the ordinary wearing away of the electrode there is a loss due to breakage of the electrodes in service, and this loss is very difficult to determine, since one lot of electrodes may be very free from breakage and another lot made at another time under different conditions may be subject to breakage and cause a very considerable loss of electrodes, and also furnace delay. This is a difficulty which is common to all arc furnaces, and which will be discussed a little more at length in connection with the Heroult furnace.

The current consumption of the Girod furnace, as given to the author by Mr. Stephan, at Ugine, varies considerably for different kinds of steels, both according to degree of refinement and to the alloys which were made. The Girod plant doubtless keeps its current consumption accurately and distributes it in a

very satisfactory manner, according to the following general plan: A record is kept over an entire year of the amount of current used in making, for instance, high carbon tool steels, as one item; as another item, would be kept the current consumption in the production of nickel steels; another item would be the current consumption of tungsten steels, and so on. It can be said in general that at the Girod plant the current consumption will vary from 900 to 1,200 kw. hours per ton, according to the quality and kind of steel that is being made. While this current consumption seems high, it should be borne in mind that all of their steel is melted from the cold and the figures given cover a year's operation, which is a much fairer basis of comparison than where figures are given for current consumption during a single week or even a month.

The product that is being made at Ugine goes largely into steel castings for the general trade in France, and into forgings. They make many tons of tool steel. When the author was there they were working on an order of 1,000 tons of tool steel for Sheffield. The plant at Ugine also has a very nice business in projectile steel for the French Government, and certain of their processes are supposed to be kept quite secret. Suffice it to say that the following analysis is one said to be used for projectiles by the French Government:

	Per cent.
Carbon. . . . .	0.36
Manganese. . . . .	0.48
Phosphorus. . . . .	0.010
Sulphur. . . . .	0.009
Silicon. . . . .	0.12
Nickel. . . . .	4.10
Chromium. . . . .	1.06

It is needless to say that this analysis was not obtained in France, nor from any Frenchman. The Girod furnace, under proper handling and metallurgical management, will make most excellent steel, and in this connection it might be well to mention that the Krupp Steel Works at Essen, Germany, has had in operation a ten-ton Girod furnace for some years. The Bethlehem Steel Company is now building a ten ton furnace of this type, and, from current report, is planning to use it for the making of high grade alloy steels as well as for certain Government work.

It should be understood that the cost of conversion in different kinds of electric furnaces will vary, and for given conditions one type of furnace may show advantages in cost of operation over other types. For this reason, and on account of the author's acquaintance and friendship with the inventors of several of the electric furnaces described, he will refrain from saying anything as to cost of producing steel in any particular type of furnace. It should also be borne in mind that where the amount of current consumption per ton is given for different kinds of furnaces, it is not a basis for the conclusion that the cost of making steel is in proportion to the current consumption. While one furnace may have a high current consumption, its costs in other respects may be lower, and vice versa, a low kilowatt consumption per ton on another furnace may offset the higher costs in other items that enter into the cost of steel making.

**The Heroult furnace.**—The third principal arc furnace is the Heroult, which is probably better known in this country than is any of the others. This furnace was invented by Dr. Heroult, of France, and has now reached a state of very high development. In the United States the patents are owned by the United



States Steel Corporation, and in their hands this furnace has probably attained its best efficiency. It is purely an arc furnace and heats the steel simply by the arcing from the electrodes to the bath. The furnace can be operated on single, two or three-phase current. Connection is made at the top of the electrode with one wire of the single-phase circuit. The current passes down the electrode and arcs to the slag or metal of the bath, passes through the bath and arcs up from the metal to the other electrode, at the top of which the returning connection is made to the generating source. The regulation of the arc is accomplished by raising or lowering the electrode, which is carried on an overhanging crane. This regulation can be done by hand, or by a very ingenious electrical device which operates a motor, which in turn raises or lowers the crane slightly, according to the resistance at the arc.

All kinds of electrodes have been used in the United States. The first electrode used by the United States Steel Corporation in its fifteen ton furnace at South Chicago was 24 in. square and 10 ft. long. These electrodes were made from amorphous carbon. The current density was about 25 amperes per square inch. Great difficulty was experienced from these electrodes breaking off in the furnace on account of the high heat near the arc and the excessive weight hanging at an angle when the furnace was tilted. Frequently chunks 3 ft. long and 2 ft. square would break off and drop into the bath. These chunks sometimes were so large that they had to be broken up by bars and sledges into smaller pieces before they could be gotten out through the doors of the furnace. The Steel Corporation went through a long period of investigating and experimenting, before it obtained electrodes that were satisfactory. For a time they used graphitic carbon electrodes, which, of course, will carry a much higher current density, and consequently can be made smaller, but which in turn cost about three times as much per pound as the amorphous electrodes. Within the last year or two, amorphous electrodes have been made in this country and thus far they are giving much better results than was formerly considered possible either in this country or in European practice. In Europe the electrode-using furnaces are still having trouble from the breakage of electrodes. Formerly the electrode consumption in the Heroult furnace would average 35 to 40 lb. per ton; then it was reduced to 30 lb., and the author has lately heard of one furnace that is averaging only 22 lb. per ton. The cost of amorphous electrodes is now  $3\frac{1}{2}$  cents per lb. in this country, so that with cold melting there is an average electrode cost of about \$1.00 to \$1.25 per ton of steel. In the case of refining hot metal, the electrode consumption will vary according to the degree of refinement, but will be on the average from 5 to 12 lb. per ton. The current consumption in the Heroult furnace will vary greatly for cold melting and according to the size of the furnace. In a well-known English steel plant, which has a small sized Heroult furnace, melting from the cold and making high quality steel, generally for the British Government, the current consumption covering a period of one year was decidedly less than 700 kilowatt hours per ton. This is a remarkably good record, especially in view of the kind of steel that was being made and the fact that the furnace was of less than three tons capacity. It speaks very well for the operators and superintendent of the furnace. However, it should be recognized that such a low current consumption on so small a furnace is only possible when commercial conditions permit continuous operation of the furnace.

It might perhaps be fair to say that on a five-ton Heroult furnace, operating for steel castings on the day turn only, a much higher current consumption should be expected. If, however, a continuous operation of a five ton furnace could be had, the current consumption in the production of steel casting quality of steel should be brought down nearly to 600 kw. hours per ton.

In the Heroult furnace, as in the Girod, the cost of roof and side walls is a considerable item in the cost of steel. In the Heroult furnace the roof is made removable in order to avoid delay of the furnace. It is common to have several roofs bricked up and ready for service, so that when a roof gives out it may be removed and another put in its place. This is accomplished in several steel plants with a delay of only one or two hours. With proper care and attention the hearth or furnace bottom will last almost indefinitely.

### Induction Furnaces.

The induction furnace is really a large transformer for alternating current of either one, two or three phases.

The first form of induction furnace was a single phase, single ring secondary or bath, known as Kjellin. Kjellin was the first to develop commercial electric furnaces and even to-day there are several old Kjellin furnaces still in use.

The next development was the Frick arrangement of the coils, which has the advantage that the surface of the bath is kept more nearly level.

The greatest single step in the development of induction furnaces was the design of the Rochling-Rodenhauser furnace at the Rochling Eisen and Stahlwerke, at Saarbrücken, Germany, by J. Schoenawa, general superintendent of the plant and a metallurgical engineer, and Rodenhauser, an electrical engineer. In this furnace there is an iron magnetic core of rectangular shape, on two legs, on which are wound coils of copper wire which carry the primary current. The secondary of the transformer is the steel bath itself, and it is in the secondary that the heat is generated which melts and refines the steel. The secondary circuit around each primary winding consists merely of one ring of metal, so that it is really a single turn circuit short-circuited on itself. The cross-section of the heating channels on the outsides is very small as compared with the main hearth of the furnace in the middle. Therefore the narrow portions at the outside of the furnace are the places where the greatest amount of heat is generated, and the circulation of the steel in these heating channels carries the steel at very high temperatures from the longer channels into the middle or hearth of the furnace. In the operation of these furnaces, the unskilled workmen have an idea that the heat is generated at the point where the channels join the main hearth, and it certainly looks as if this were the case, as the steel at a white heat comes flowing out from the longer channels into the main hearth, and by contrast with the comparatively cold hearth, the steel coming from the channel looks enormously hot. You can get a little idea of the resistance that is being overcome in these channels when you understand that the voltage in this bath is only from five to ten, while the amperage varies from fifteen to thirty thousand, and sometimes much higher. The voltage on the primary side of some furnaces may be as low as 450 volts, while other furnaces are designed for 5,000 volts, and there is one furnace being built now that will receive its primary current at 11,000 volts.



The induction furnace has no electrodes and, consequently, is free from electrode troubles. On the other hand, the shape of the bath is much more complicated than is the case in arc furnaces, and the slag line is probably at least twice as long as that of the open hearth or arc furnace of the same capacity. The result is that the scorification at the slag line is much greater than in the case of the arc furnace, and this is accentuated by the fact that the slag action is concentrated at certain points along the extended slag line, on account of certain magnetic and electrical conditions in the furnace. This scorification difficulty is further increased because the banks of the furnace are of necessity so straight up and down that repairs between heats are almost impossible. The result is that after a certain number of heats the furnace must be shut down, the magnetic core taken apart, the roof and a portion of the lining torn out, and a new lining put in to take the place of the wear that has occurred due to the scorification of the slag line. The result is that in European practice after every fifteen days the furnace must be shut down, new lining put in, and the furnace then re-heated. On an average this requires sixty hours, or two and one-half days of furnace delay. To an American steel man, a two and one-half days' shut down out of each eighteen days seems ridiculous, and it would be impossible under American conditions of steel plant operation, but in Europe such a delay does not seem to be prohibitive or even serious.

The current consumption on the induction furnace varies, of course, with the size of the furnace and the quality of the metal being turned out, but in general it can be said that it will run from 650 to 900 kw., hours per ton. This, of course, includes the current required for drying out and heating up the furnace after the necessary shut downs for repairs. The present types of induction furnaces all have the common disadvantage that a portion of the molten charge, varying from  $\frac{1}{4}$  to  $\frac{1}{2}$ , must always be retained in the furnace after pouring a heat, in order to maintain the metallic circuit for the secondary on the next charge. However, if hot metal from a Bessemer or open hearth is being used, the induction furnace can be emptied entirely, since the hot metal will immediately flow around in the heating channels and constitute the metallic circuit.

Notwithstanding the fact that the wear on the lining is a distinct advantage, nevertheless the induction furnace has certain advantages which weigh against this great disadvantage. The current demand of the induction furnace is much more uniform and the consequent load on the generating plant is much more desirable than is the case with the arc furnace. Furthermore, the total kilowatt capacity used by the two furnaces is quite different. The fifteen ton Heroult furnace at South Chicago has a total of 2,250 kw. transformer capacity available. This furnace has a power factor of 0.89 to 0.90. A certain five ton arc furnace is operating at the present time with a 900 kw. transformer capacity with a power factor of 0.93 to 0.94. On the other hand, a five ton induction furnace would require only about 600 kw. It would operate, however, with a power factor of about 0.6, and to obtain even that a low frequency would be necessary.

This means that for the induction furnace a very much larger generator would be required, but that the prime mover for the generator need be of only 600 kw. capacity. The result is that the installation cost for the induction furnace is somewhat more than is the case with the arc furnace. The induction furnace requires in addition, in order to obtain a power factor

of even 0.6, a source of current of very low frequency. For instance, a two ton furnace should have a frequency of not more than twenty-five cycles per second; a five ton furnace should have fifteen cycles, and one of the largest furnaces now operating in Europe is supplied by an alternator with a frequency of only five cycles.

However, the disadvantages are not all on the side of the induction furnace. It has certain advantages which, to a person who has had experience with open hearth practice, are very great. The process of melting and refining a heat of steel in the induction furnace is simplicity itself, and the action of the furnace in operation is fascinating. In Norway the writer saw a four ton furnace charged with cold scrap that apparently had been accumulated from the four corners of the earth. The charge consisted of iron and steel borings and turnings caked and rusted, with some old horseshoes, a considerable quantity of wrought iron nuts and bolts, some scrap obtained through the dismantling of old ships, some sheet tin scrap, in fact, about as poor a lot of scrap as one can imagine, and in such form that an open hearth melter in this country would almost refuse to use it. The charge was shoveled into a furnace which had about one ton of molten steel in the bottom. After the furnace was filled full with about one-half the charge, the current was turned on by simply turning a switch and setting a rheostat so as to give the desired amount of power input to the furnace. After doing this, the melter walked away and did not come near his furnace again for an hour. The author stayed to watch the progress of the melt. There was almost no noise, there was no smoke or flame coming from the furnace, except for the first four or five minutes while the grease and volatile matter were burning out of the charge. After the first five minutes there were no fumes, gases or smoke pouring out from the furnace, and the redness gradually rose through the charge, due to the heat in the heating channels, until in the course of fifteen or twenty minutes after the charge was put in, the outside of the pieces of steel began to sweat and the molten drops began to run down into the bath. In the course of three-quarters of an hour, the entire mass had settled down into the molten bath and the furnace was ready to receive the balance of its charge of cold scrap. The same operation was repeated on the second half, and after the entire charge was melted down, a slag was made to remove the phosphorus. This particular heat was intended for some cheap tool steel and no special effort was made to reduce the phosphorus and sulphur to a low point. The analysis of the steel made on this particular heat is given below:

	Per cent.
Carbon. . . . .	0.80
Manganese. . . . .	0.28
Sulphur. . . . .	0.027
Phosphorus. . . . .	0.008
Silicon. . . . .	0.20

The author feels like saying for the induction furnace that its actual operation by the metallurgist or melter is most exceedingly fascinating and attractive, as compared with the operation of an open hearth furnace.

It has been claimed by some advocates of the arc furnaces that the induction furnace will not refine because the slags are too viscous, since they are colder than the steel. Within the last three years it has become possible to refine in the induction furnace just as well as in the arc furnace, where the slag is hotter



than the metal and is consequently very liquid. All the author has to say in reply is that he has never seen in any open hearth furnace more liquid slags than he saw on the induction furnaces in the Rochling plant in Germany. And as evidence that refining is possible, he gives the analysis of eight and one-half tons of basic Bessemer rail steel that he saw blown in the converter, then transferred to an electric induction furnace, and refined to an ordinary grade of tool steel. He saw both samples taken from the heats and had them analysed in this country. The rail steel charged into the electric furnace was:

	Per cent.
Carbon. . . . .	0.76
Phosphorus. . . . .	0.013
Sulphur. . . . .	0.072

The tool steel tapped from the electric furnace was:

	Per cent.
Carbon. . . . .	0.80
Phosphorus. . . . .	0.006
Sulphur. . . . .	0.021

After this necessarily superficial explanation of a few of the different furnaces, it will be apparent to anyone considering the installation of an electric furnace that there is at least a good variety to choose from, and a more detailed investigation will make apparent also the fact that many inter-dependent technical and commercial considerations will enter into a wise choice of a furnace. For instance, an induction furnace must have a little current kept on all the time, and is, therefore, more suited to a continuous operation, while an arc furnace will be better adapted to intermittent operation. On the other hand, if current be purchased from a central station, the cost of current per unit will be materially increased by a higher "demand." Since, for instance, a five ton Heroult furnace needs 900 kw., with even an overload capacity, its "demand" and hence its unit cost of current will probably be higher than that for a five ton induction furnace, which needs at most only 600 kw. capacity and can use current steadily up to its maximum demand. In such circumstances, an induction furnace might obtain a much lower price for current per unit and at the same time its consumption of current per ton of steel would not be materially different from the arc furnace. There are many other technical features which might be mentioned that may determine the success or failure of a given installation. It is therefore quite evident that in the choice of an electric furnace to be operated under given conditions, a very careful and detailed investigation should be made of all the technical details of the furnaces in their relation to the commercial conditions of current supply and the steel plant operations.

(To be Continued)

**International Nickel.**—Of 2,840 stockholders registered on the books of International Nickel Co. on June 30, 1914, 390 were European, holdings amounting to \$849,900, of a total outstanding stock of \$47,044,100. On June 30, 1913, there were 2,349 stockholders, of whom 404 were European, holdings totalling \$792,800. Number of women stockholders June 30, 1914, totalled 972 as against 811 on June 30, 1913.

## PERSONAL AND GENERAL

Mr. J. Parke Channing was operated on last week for appendicitis. He is reported improving steadily.

Mr. F. C. Andrews, who graduated in mining at the University of Toronto last spring, and has since been working at Poreupine, has given up his position in order to enlist for service abroad. Being too late for the first contingent he has sailed for England, hoping to be allowed to join the Canadian contingent there.

Prof. A. P. Coleman is on an extended trip abroad. He was last heard of from Ceylon. During his absence part of his work at the University of Toronto will fall on Prof. Parks and Mr. McLean, while Dr. W. G.



**Dr. W. H. ELLIS**

Acting Dean, Faculty of Applied Science,  
University of Toronto

Miller, Provincial Geologist, will give a series of lectures.

Mr. R. B. Stewart was in Toronto last week after spending two months in the Beaver Lake district.

Prof. Geo. Guess, head of the department of metallurgy at the University of Toronto, is at Anyox, B.C., having been retained by the Granby Co. in connection with the operations of the new smelter. He is expected to return to Toronto shortly to assume his college duties.

Mr. R. B. Lamb has moved his office from room 703 Traders Bank Building, Toronto, to room 501 in the same building.



Judge E. H. Gary, chairman of United States Steel Corporation, has resigned as a director of all companies not affiliated with the Steel Corporation. Judge Gary began withdrawing from directorates of corporations other than United States Steel about a year ago.

Mr. Frank E. Lathe, of the staff of the Granby Consolidated Mining, Smelting and Power Company, is in Toronto.

Dr. W. H. Ellis has been appointed acting Dean of the Faculty of Applied Science, University of Toronto, pending the appointment of a successor to Dr. John Galbraith. Dr. Ellis has been a member of the staff since 1878.

Messrs. O. E. LeRoy, G. C. Mackenzie, E. Lindeman and J. McLeish, of the staff of the Department of Mines, have been appointed a committee to make an enquiry into the condition of the iron mining industry in Canada.

## SPECIAL CORRESPONDENCE

### PORCUPINE, SWASTIKA, KIRKLAND LAKE

**Tough Oakes.**—The Tough-Oakes company is now devoting attention chiefly to the erection of the 100 ton mill and the treating of dump ore in the present small mill. The foundations of the new mill are being laid with all expedition, and it is hoped to get the building ready for the machinery before the hard weather. The capacity of the small mill is being raised from 12 tons a day to 50.

**Harricanaw.**—Some remarkable samples are being obtained from the Harricanaw field in Northern Quebec. This is particularly the case in regard to the claims held by the Homestake Porcupine mines, which has an interest in about 800 acres. The samples from a vein on the Clark properties are particularly good.

**Schumacher.**—One drill is being run at the Schumacher mine, the contractors finishing their work and being allowed to go. Sinking has been stopped, but veins already found above the 300 ft. level will be developed as far as the working force maintained will allow.

**Hollinger.**—The first of the new compressors installed in the Canadian Mining and Finance power house on Gillies lake should be running early this month. The Fraser & Chalmers compressor has been shipped from England, and once delivery has been made it will be quickly set up. The two machines will give the Hollinger group approximately 100 extra drills. These have been badly needed for some time. Owing to the lack of compressed air for the last two months the work on the Hollinger has had to be largely curtailed. Work in several of the outlying shafts on the Hollinger and the Acme was stopped. This situation has been rendered still more acute, since the Vipond commenced underground operations, as the Hollinger up to that time had the use of the Vipond compressor.

The sinking of the main working shaft for the three Canadian and Mining Finance properties has been commenced. It is about 1,000 ft. from the present main shaft of the Hollinger. The shaft will be taken down 1,300 ft., levels being opened up at 425 and 800 ft.

There are now 900 men on the Hollinger pay roll.

**Vipond.**—The continuous decantation process at the Porcupine Vipond is now running smoothly at the Vipond mine, and the second clean-up from the mill has just been made.

**Porcupine Pet.**—The very spectacular ore shoot encountered by the Porcupine Pet at the 50 ft. level has attracted much comment in the camp. The little stamp

mill at this property is running continuously and the first gold bar has been shipped out.

**Dome.**—The new management at the Dome mine is busily seeking economies of operation. In the rock house a bin is to be installed in which broken ore can be stored from the mine. Previously all the ten cars were dumped into the big crusher at once and the belt conveyor was full only for about half its length. Now it will be evenly distributed, with a consequent economy in power. The small dump cars underground are to be replaced by ones of much larger capacity and the ore chutes will be widened so that the rock will not jam, and dynamite will not have to be used to loosen them. The new cars can be handled with much greater economy of time.

### COBALT, GOWGANDA, SOUTH LORRAINE

With the resumption of work on the Timiskaming and the Beaver there is now not a producing mine in the Cobalt camp that is shut down on account of the conditions following the war. The Beaver is putting on a full gang of men underground. The mill has been running to capacity without stop. The Timiskaming is for the present putting four drills underground. These two properties are now controlled by the same interests. The Timiskaming closed down a month or so before the war, it being understood that the ore was rapidly being depleted. Before development operations on a considerable scale can be resumed, some outlay would have to be made in timbering, although stopping and sinking could be continued. The shaft is down to the 750 ft. level. The Drummond Fraction, working the parcel of ground between the Caribou Cobalt and the Kerr Lake, and operated jointly by the Crown Reserve and the Kerr Lake, has resumed with a few men breaking ore for their contract with the Dominion Reduction Co.

Altogether it is probable that there are no more men out of work than has been normal all this year. Quite a large number of men left the camp when so many mines closed down in the first few weeks of the war and not more than half of these have returned. There are still three or four men for every job that offers, but there is not the same fear of unemployment this winter. It is also to be considered that there are not now many men employed in trenching or other surface work that stops when the snow falls, and that beyond a few men on the La Rose those employed now are permanently employed.

It must also be conceded as an evidence of fair play on the part of the mine owners that there has been no organized attempt, no thought even, of cutting wages or lengthening hours, and that in spite of the fact that there was a good deal of opposition to the Government measure of the eight-hour day which became operative only this year. In one or two instances some attempt has been made to cut wages, but it has not been with the consent of the majority of the operators.

To make work for those who cannot find employment, some of the companies have been doing odd jobs that were not absolutely necessary, and for this, of course, a minimum wage has been paid; but for all the ordinary work of a miner on surface or underground no change in pay or hours has been either attempted or made.

**Cobalt Lake.**—It is officially announced that Cobalt Lake will not be drained till next spring, although preparations are now being made to lower the surface of the water some six and a half feet. As a consequence



of the disappearance of credit to municipal corporations, the town of Cobalt has found it impossible to raise money to carry out the laying of the sewer and the provision of sewer disposal which will have to be accomplished directly the lake is drained. In these circumstances the Cobalt Lake Mining Co. is shouldering the burden of laying the main sewer pipe as well as of pumping the lake. As soon as the lake is sufficiently low the sewer pipe will be laid and the lake will then be allowed to resume its former height until the spring, a temporary dam being cut in the rock cut near the Right of Way mine.

Good ore is being found in the conglomerate in the winze below the 226 ft. level. The vein itself, at a depth of 390 ft., is only an inch wide, but the whole of the ore being broken will be of good milling grade. It is anticipated that production from the Cobalt Lake mine this year will materially exceed that of 1913, when it was considerably over the million ounce mark.

**La Rose.**—Following the decision of the company to spend some of the large cash surplus in development work, the La Rose is very energetically exploring. On the main La Rose the high ground between the O'Brien and the La Rose is being cleared of overburden by a large gang of men. It will be systematically searched for small veins. Some time ago a long crosscut was run from the first level through this section of the property, but no surface work has been attempted before.

On the La Rose Extension a shaft is being sunk in order to explore this forty acres. So far nothing has been discovered on it of any importance. The formation is conglomerate and it is known to be very deep here. The shaft will be put down so that crosscuts can be run under swampy ground in order to endeavor to pick up veins.

At the University two long crosscuts are being run for exploration purposes. The one is being taken from the 180 ft. level of the Lawson to connect with the No. 1 shaft of the University, and the other to run from the University shaft to crosscut the No. 2 vein of the University. Further exploration work is also being done from the Lawson in the diabase.

The La Rose will pay its regular quarterly dividend on October 20th, amounting to \$187,328.37 or 2½ per cent. Altogether this company has now paid 67 per cent or \$4,825,135.

## BRITISH COLUMBIA

**Dividends.**—The total amount of dividends declared during nine months ended September 30, 1914, by metalliferous mining companies operating in British Columbia is stated to be \$1,453,219. The Consolidated Mining and Smelting Company of Canada, Ltd., has declared three dividends each of two per cent., or at the rate of eight per cent, per annum; the Granby Consolidated Mining, Smelting and Power Co., Ltd., paid two of one and one-half per cent. each, or at the rate of six per cent. per annum, but passed its dividend for the third quarter of the year; the Hedley Gold Mining Co. has made its customary distribution of five per cent. every three months, this being a quarterly dividend of three per cent. and a bonus of two per cent., together equal to a rate of 25 per cent. per annum; and the Standard Silver-Lead Mining Co. has paid eight monthly dividends and one extra, each of two and one-half cents a share, while its September distribution was only one and one-quarter cents a share, owing to the cessation of production consequent on the disorganization of the market for metals and the resultant stop-

page of ore buying by the smelting companies. The several proportions of the above-mentioned total of dividends for 1914 are as follows:

	Amount of Dividend.	Total. for 1914.
Consolidated M. and S. Co., three dividends each of ..	\$116,088	= \$ 348,264
Granby Con. M. S. & P Co., two dividends each of ..	224,977.50	= 449,955
Hedley Gold Mining Co., three dividends each of ..	60,000	= 180,000
Stand. Silver-Lead Mng. Co., nine dividends each of ..	50,000	
and one of .....	25,000	= 475,000

Total of dividends for nine months..... \$1,453,219

Neither the British Columbia Copper Co. nor the Le Roi No. 2, Ltd., both of which have been dividend-payers in past years, is on the list for the current calendar year. The published dividend figures for 1912 show a total of \$1,224,089, and for 1913 \$2,390,131. While the total for the whole of 1912 has already been passed, there is little probability of this year's total being as large as that of last year. It is expected that the Consolidated Co. will declare another two per cent. dividend before the close of 1914, and that the Hedley Co., which is steadily maintaining its production of gold on its normal scale, will in December follow the course it has adopted at the close of each of the last two years and declare dividend and bonus together fifteen per cent., equal to \$180,000. The Standard Silver-Lead Co.'s dividend payments during the three closing months of the year may be determined by the decision of the company in the matter of resuming production of ore. If it shall be decided that the terms and conditions under which the smelting company will accept custom ore are such as will prove too much to the disadvantage of the seller, there will not be an immediate resumption of production at the Standard mine. It may be, though, that whether the mining and shipment of ore be shortly resumed or not, the Standard Co. will pay a monthly dividend at the reduced rate in September, in which case there will be \$75,000 from this source to be added to the year's total. Assuming that these three companies shall make further dividend payments in 1914, as above indicated, the total of all metalliferous mining companies for the year will be \$1,824,307, which will be \$565,824 less than that of 1913. Of course there is a possibility that the Granby Consolidated Co. will pay another dividend of \$224,978 before the year shall close, and, if so, the total decrease will be proportionately smaller.

### East Kootenay.

While the figures to show the quantity of ore received during the last week in September at the Trail smelting works from the Sullivan lead mine, situated near Marysville, in Fort Steele mining division, have not been published in time to be included in the totals now to be given, it is known that during the third quarter of the current year more ore reached Trail from that mine during the three months, July-September, than during the six months, January-June. The figures for thirteen weeks ended April 2, were 4,363 tons, for thirteen weeks ended July 2, 5,700 tons, making a total of 10,063 tons for the first half of the year. For twelve weeks ended September 24, the total is 12,699 tons. The smeltery receipts from the St. Eugene mine for the expired part of the year to the last mentioned date have been 949 tons. Estimating receipts for the week ended October 1 at about 1,300



tons, it will be seen that the total quantity of lead ore to reach the smeltery from East Kootenay mines in nine months of 1914 was approximately 25,000 tons. No authentic information is available yet concerning the placer gold output of Fort Steele division, but this is not likely to prove to have been more than a few thousand dollars in value.

#### West Kootenay.

**Ainsworth Division.**—During four weeks ended September 24, 232 tons of lead concentrate from the Bluebell mine, Kootenay lake, and 227 tons of silver-lead ore from the Maestro in Ainsworth camp, reached the Consolidated Co.'s smelting works at Trail. None was received from the Highland and No. 1 mines, both of which were shippers every month of the year until September. Development work has been continued at the Silver Hoard mine, also in Ainsworth camp, but no ore has been shipped from this mine since last January. The Utica, near the western boundary of the division, had two cars of ore reach Trail in September, but its output thus far this year has been comparatively small. Shipment recently took place of a car of marble from the quarry north of Kootenay lake to one of the prairie cities of the West.

**Slocan Division.**—There was less ore shipped from Slocan mines during the month of September than in any other month of 1914. One car of silver-lead ore from the Surprise, near Cody, and 169 tons from the Rambler-Cariboo constitute the total receipts at Trail. Both these properties are being worked now, as well as several others around Sandon.

There is little change in conditions at a number of other Slocan properties that were mentioned a few weeks ago. In regard to others—the California, near New Denver, is being worked in a small way under lease, and it is reported that indications of the nearness of ore show in a raise being made; work is being continued at the Apex, where a pipe line to bring in water for power purposes is a recent addition to plant; in McGuigan basin a crosscut adit from the Rambler-Cariboo main low level working to the Best claim has been arranged for, the Rambler-Cariboo company having contracted to drive this adit for Mr. A. W. McCune and associates.

**Nelson.**—The Pingree Mines Co., with the management of which Mr. J. L. Stamford, of Victoria, has long been actively connected, is employing six men on its property, situated on Eagle creek, a few miles from the city of Nelson. Mr. Frank E. Pearce is in charge of development, and some showings of nice looking copper-gold ore have been opened on the property. In the same neighborhood a number of placer gold mining leases have been taken up and arrangements made to work them as a partnership property. Water was brought on to a part of the ground last season, and a little coarse gold was won, but freshets took out the water supply line, so it is probable nothing more will be done until next season.

In the southern part of Nelson mining division there has been made a change in the wages at several mines. It has been announced by advertisement in the Daily News that as from October 1 the following scale will be in effect: Miners, \$3.50 a day; shovellers and trammers, \$3; and surface laborers, \$3. The mines affected by the reduction are the Ymir-Wilcox, near Ymir; Second Relief, in Erie camp; Emerald, H.B., and Zincton, near Salmo; and the Motherlode, on Sheep creek. For a year or more the Ymir Miners' Union has had a notice in the Daily News intimating that there is a

strike on at the Queen mine, Sheep creek, at which refusal was persisted in to pay \$4 a day as regular wages for miners, though it has been stated that in some parts of that mine \$3.75 was paid, but now the scale is the same as decided on for the other mines above-mentioned.

Work is being done, under lease, on the Golden Fawn, Sheep creek, by Anderson & Burnham, who have also leased the small stamp mill at the Nugget.

**Rossland.**—There has been a gradual increase in the quantity of ore shipped from Rossland mines during the three quarters of 1914. For thirteen weeks ended April 2, the total was 62,143 tons, an average of 4,780 tons a week; for thirteen weeks ended July 2, it was 65,782 tons, an average of 5,060 tons a week; for twelve weeks ended September 24, it was 71,495 tons, an average of 5,958 tons a week. The total quantity for the year to September 24 was 199,420 tons.

**Trail.**—The fiscal year of the Consolidated Mining and Smelting Company of Canada, Ltd., ended on September 30. Approximately 386,000 tons of ore was received at the company's smelting works at Trail during that period. This quantity gives an average of rather more than 32,000 tons a month, as compared with a little better than 27,000 tons a month for the fiscal period ended September 30, 1913. The average increase, therefore, has been about 5,000 tons a month.

#### A TUBULAR STEEL TRIPOD.

Several novel features have been introduced into the construction of the Morris folding tubular steel tripod, and these are described in bulletin Y17, of which a copy has been submitted to us by the Herbert Morris Crane & Hoist Co., Ltd. One feature which will appeal to users of this kind of lifting gear is the ability to fold up the tripod without removing any bolts or pins. A broad flange is provided on each foot to enable the tripod to carry a load on soft ground, and a square point gives a good "grip" on harder surfaces. Another new feature is that provision of a small pulley at the top of tripod by which a small rope can be used to haul up the heavy lifting block or to handle very light loads quickly. Every tripod is tested with a 50 per cent. overload, so that the safety of the user is always assured. It is also worthy of note that even in the one ton capacity the tripod is light enough for one man to carry on his shoulder. Those who have had experience of hauling around the home-made wooden shear-leg will be able to appreciate this feature to the full.

#### BYERS GALVANIZING PLANT.

The new galvanizing plant recently completed by the A. M. Byers' Company at their mills in Pittsburg contains the most modern and efficient equipment for manipulating the galvanizing process known to-day. The galvanizing specifications call for a coating of highest grade prime Western Spelter, and a deposit 100 per cent. heavier than that required in Government galvanizing specifications.

#### A NEW MORRIS CRANE.

An interesting new standard overhead crane has been introduced to the Canadian market by the Herbert Morris Crane & Hoist Co., Limited. A description of this crane is embodied in bulletin B9 just issued by the company.

## MARKETS

## STANDARD MINING EXCHANGE.

Toronto, Oct. 9, 1914.

As different mining properties continue to report favorable progress public interest in mining affairs shows a tendency to broaden. There appeared to be rather more buying orders on the Standard Exchange yesterday, but not many were filled, as buyers were not disposed to bid stocks up except in some isolated cases. The advancing movement in Hollinger, which yesterday sold at \$18.10, ex-dividend, has had a tendency to strengthen the market for Dome mines. Another hundred shares of this stock sold at \$6.50. Some large interests in Dome Lake were buyers of the stock again at 32. Accumulation by the Timiskaming & Hudson Bay Company is said to have reached considerable proportions during the last few months.

## Transactions on Oct. 9.

	Open	High	Low	Close	Sales
Cobalt Lake ....	38	....	....	38	100
Dome. ....	6.50	....	....	6.50	100
Dome Ex. ....	5	....	....	5	500
Dome Lake ....	32	....	....	32	400
Hollinger. ....	18.10	....	....	18.10	110
Timis. ....	9½	10¼	9½	10¼	1200

## Closing Quotations.

	Ask.	Bid.
<b>Cobalts—</b>		
Bailey. ....	¾	½
Beaver. ....	25	23
Buffalo. ....	..	75
Chambers-Ferland. ....	15	11
City of Cobalt. ....	..	30
Coniagas. ....	..	6.00
Crown Reserve. ....	1.08	1.06
Kerr Lake. ....	4.75	4.25
La Rose. ....	75	..
McKinley. ....	..	40
Nipissing. ....	6.00	5.35
Peterson Lake. ....	23¼	..
Timiskaming. ....	10½	10
Wettlaufer. ....	..	5
<b>Porcupine—</b>		
Dome Extension. ....	5½	5
Dome Lake. ....	34	31½
Dome Mines. ....	6.70	..
Hollinger. ....	18.20	18.00
Jupiter. ....	7	6½
Rea. ....	..	10

## STANDARD EXCHANGE.

The minimum scale fixed by the Exchange, and below which no sales are permitted, is as follows:—

<b>Cobalts—</b>	
Beaver. ....	.17
Buffalo. ....	.75
Chambers-Ferland. ....	.10
Canadian. ....	.05
City of Cobalt. ....	.30
Cobalt Lake. ....	.30
Coniagas. ....	6.00
Crown Reserve. ....	1.00
Great Northern. ....	.04
Hudson Bay. ....	30.00
Kerr Lake. ....	4.00
La Rose. ....	.70
McKinley-Darragh. ....	.40
Nipissing. ....	4.75
Peterson Lake. ....	.23
Seneca Superior. ....	2.00
Timiskaming. ....	.07
Trethewey. ....	.12

Wettlaufer. ....	.04½
York, Ont. ....	.07

## Porcupines—

Dome Extension. ....	.05
Dome Lake. ....	.30
Dome Mines. ....	6.50
Foley O'Brien. ....	.20
Hollinger. ....	16.00
Homestake M. F. ....	.20
Jupiter. ....	.04
McIntyre. ....	.27
Pearl Lake. ....	.02
Porcupine Crown. ....	.75
Porcupine Peterson. ....	.25
Porcupine Vipond. ....	.17
Rea Consolidated. ....	.10
Teck Hughes. ....	.07
West Dome. ....	.05

## TORONTO MARKETS.

Oct. 8.—(Quotations from Canada Metal Co., Toronto)—

Spelter, 6 cents per lb.
Lead, 5 cents per lb.
Tin, 33 cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 13½ cents per lb.
Electrolytic, 13½ cents per lb.
Ingot brass, yellow, 10c. per lb.; red, 12c. per lb.

Oct. 8.—Coal—(Quotations from Elias Rogers Co., Toronto)—

Anthracite, \$7.75 per ton.
Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Oct. 7.—Connellsville coke, (f.o.b. ovens).

Furnace coke, prompt, \$1.65 to \$1.70 per ton.
Foundry coke, prompt, \$2.25 to \$2.35 per ton.

Oct. 7.—Tin, straits, 30.80 cents.

Copper, Prime Lake, 11.75 cents.
Electrolytic copper, 11.50 cents.
Copper wire, 13.00 cents.
Lead, 3.50 cents.
Spelter, 4.85 to 4.90 cents.
Sheet zinc, (f.o.b. smelter), 8.50 cents.
Antimony, Cookson's, 13.00 cents.
Aluminum, 18.00 to 18.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, \$48.00 to \$50.00 per ounce.
Platinum, hard, 10 p.e., \$52.00 to \$54.00 per ounce.
Bismuth, \$2.75 to \$3.00 per pound.
Quicksilver, \$52.50 per 75-lb. flask.

## SILVER PRICES.

	New York cents.	London pence.
<b>September—</b>		
25. ....	53	24¼
26. ....	53½	24¼
28. ....	52¾	24
29. ....	53¾	24¼
30. ....	52¾	24
<b>October—</b>		
1. ....	52¾	24
2. ....	52½	24
5. ....	52½	24¼
6. ....	52¾	24
7. ....	52½	24





# WHEN YOU BUY HOSE

There are two ways to buy Hose. One is to let Price govern and take chances. The other is to buy for SERVICE and take no chances.

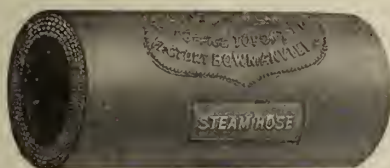
The latter is the Goodyear way.

Hose is a service utility. If the Hose lacks, service lacks.

And this is a mighty important factor in mines where Hose tests are supreme. In these places Hose is subject to hard knocks and rough hand-

ling. Suspended operation through inferior Hose becomes a most expensive, not to say a mighty serious proposition.

Remember that in the Goodyear line is Hose for every exact purpose, designed and made after a careful study of actual work conditions. Every Goodyear product is made to set a new standard rather than to meet a price. Goodyear service means the best kind of economy.



## "GOODYEAR" BRAND

An unusually high-grade Hose, with a specially compounded tube. Steam cannot force its way through the sides. Rapid hardening cannot occur. The tube cannot "cook." All this means a Hose of greater life, greater service, greater economy, greater all around satisfaction.

Besides this the tube of Goodyear Steam Hose is oil resisting. This tube has been tested for 1446 hours at 100 pounds steam pressure, with oil injected. The tube was not affected by the oil in any way.

This Hose comes wire wound when desired. This wire winding gives the Hose long life under rough and continuous handling. It protects the Hose and keeps it intact under most severe abuse.

## "BLACK DIAMOND" BRAND

This is a moderate pressure Hose with a Marline woven jacket that protects it against rough handling and prevents disintegration. It is a Hose made for service and economy. A fine hose for all round steam uses.

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Goodyear also makes Water Hose, Pneumatic Tool Hose, Belting and Packing for every purpose.

Buy mine equipment the Goodyear way. Let Goodyear experts tell you of the very Goodyear product for the very purpose. Remember that the same quality standards govern in the making of Goodyear Mechanical Products as in the making of Goodyear Automobile Tires which have won world leadership.

Goodyear prestige must not be jeopardized. Every Goodyear product must be made to set a master standard.

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

#### REPORTS RECENTLY ISSUED:

##### CANADA

Prospector's Handbook No. 1. Notes on radium-bearing minerals, by Wyatt Malcolm.

Museum Bulletin No. 2. Contains short scientific papers.

Summary Report of the Geological Survey for the year 1912.

##### NEW BRUNSWICK and NOVA SCOTIA

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

##### QUEBEC

Memoir 22. Preliminary Report on the Serpentine and Associated Rocks of Southern Quebec, by John A. Dresser.

Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.

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##### NORTH-WEST PROVINCES

Memoir 47. Clay and Shale Deposits of the Western Provinces, Part 3, by Heinrich Ries.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

##### BRITISH COLUMBIA

Memoir 19. Mother Lode and Sunset Mines, Boundary District, B.C., by O. E. LeRoy.

Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.

##### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

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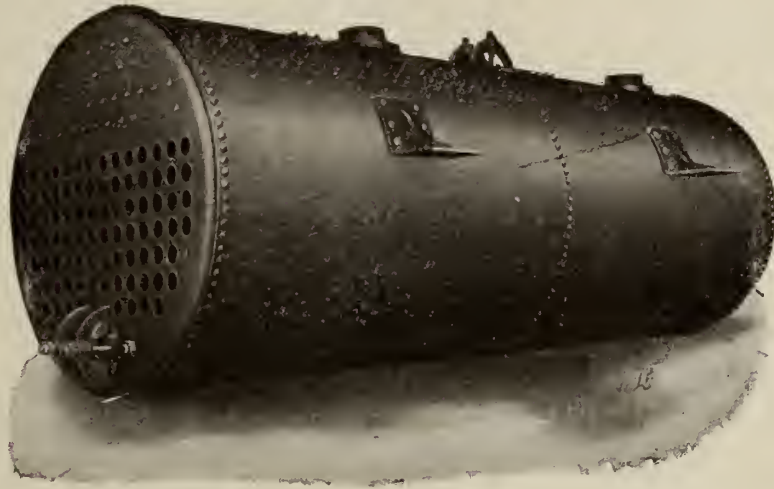
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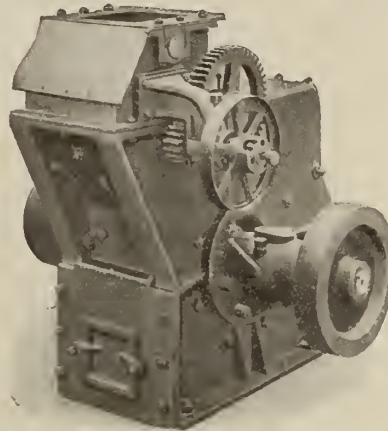


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Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.

## Condensers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

## Converters—

Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Mussens, Ltd.

## Conveying Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Conveyor—Trough—

Hendrick Mfg. Co.

## Cranes—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
M. Beatty & Sons, Ltd.

## Cranes—Electric—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Cranes—Overhead Traveling—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Crane Ropes—

Mussens, Ltd.  
Allan, Whyte & Co.  
Thos. & Wm. Smith  
B. Greening Wire Co., Ltd.

## Cranes—Swing Jib—

The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—Wall—

The Herbert Morris Crane & Hoist Co., Ltd.

## Crushers—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Lymans, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Hadfields Steel Foundry Co.

## Cyanide Plants—

Jenckes Machine Co., Ltd.  
Fraser & Chalmers, Ltd.  
Roessler & Hasslacher  
Thos. & Wm. Smith  
Peacock Bros.

## Derricks—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Diamonds (for Diamond Drills)—

Abe. Levine

## Diamond Drill Contractors—

Diamond Drill Contracting Co.  
Smith & Travers.

## Dredging Machinery—

Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.

## Dredging Ropes—

Allan, Whyte & Co.  
Fraser & Chalmers, Ltd.  
B. Greening Wire Co., Ltd.

## Drills, Air and Hammer—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.

## Drills—Core—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.

## Drills—Diamond—

American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.

## Drill Steel Sharpeners—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Mussens, Ltd.

## Drills—Electric—

Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

## Dump Cars—

Sullivan Machinery Co.  
Mussens, Ltd.

## Conveyors—Belt—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.

## Dynamite—

Curtis & Harvey (Canada), Ltd.

## Canadian Explosives

Northern Canada Supply Co.

## Dynamos—

Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.

## Electric Cranes—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Elevating and Conveying Machinery—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Ejectors—

Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

## Elevators—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Peacock Bros.

## Engineering Instruments—

C. L. Berger & Sons  
Peacock Bros.

## Engineers and Contractors—

Fraser & Chalmers, Ltd.  
Roberts & Schaefer Co.

## Engines—Automatic—

Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Gas and Gasoline—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.  
Alex. Fleck  
Sullivan Machinery Co.  
Smart-Turner Machine Co.  
Peacock Bros.  
John Inglis & Co., Ltd.  
Can. Fairbanks-Morse Co.

## Engine—Haulage—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.

## Engines—Marine—

Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Oil—

Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

## Engines—Steam—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
The John Inglis Co., Ltd.

## Fans—Ventilating—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.

## Feeders—Ore—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.

## Flights—

Hendrick Mfg. Co.

## Friction Hoists—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Forges—

Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.

## Forging—

M. Beatty & Sons  
Smart-Turner Machine Co.  
Peacock Bros.



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Main Western Office - VICTORIA, B.C.

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means quality

Get this stamp on your explosives and you get efficiency.

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We specialize in explosives for safe coal getting and rock work.

We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

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Our Stumping Powder has made land clearing cheap and easy for the farmer.

We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

## DISTRICT OFFICES:

NOVA SCOTIA:	-	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,	-	-	Kingston
MANITOBA:	-	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,	-	-	-	Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 28.)

**Furnaces—Assay—**  
Lymans, Ltd.  
Mussens, Ltd.

**Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada),  
Limited  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian H. W. Johns-Man-  
ville Co., Ltd.

**Gears—**  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

**Generators—**  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

**Hangers—Cable—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.

**Hand Hoists—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Heaters—Feed Water—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**High Speed Steel Twist Drills—**  
Mussens, Ltd.  
Northern Canada Supply Co.

**Hoists—Air Electric and  
Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

**Hoists, Chain, Electric and  
Pneumatic—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Hoisting and Conveying Mach-  
inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.

**Hoisting Engines—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Sullivan Machinery Co.  
Fraser & Chalmers, Ltd.  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons

**Hoists—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.

**Hose—**  
Canadian H. W. Johns-Man-  
ville Co., Ltd.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.

**Jacks—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

**Jigs—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.

**Lamps—Acetylene—**  
Mussens, Ltd.  
Northern Canada Supply Co.

**Lamps—Safety—**  
Mussens, Ltd.  
Canadian Explosives  
Peacock Bros.

**Link Belt—**  
Northern Canada Supply Co.  
Jones & Glassco

**Locomotives—Electric—**  
Mussens, Ltd.  
Jeffrey Mfg. Co.

**Locomotives—Steam—**  
Mussens, Ltd.

**Metal Merchants—**  
Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.

**Monel Metal—**  
Orford Copper Co.

**Motors—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.

**Ore Sacks—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.

**Ore Testing Works—**  
Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell

**Ores and Metals—Buyers and  
Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Orford Copper Co.  
Canada Metal Co.

**Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.

**Pick Machines—**  
Sullivan Machinery Co.

**Picks—Steel—**  
Mussens, Ltd.  
Thos. & Wm. Smith  
Peacock Bros.

**Pipes—**  
Consolidated M. & S. Co.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.

**Pipe Fittings—**  
Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.

**Pneumatic Chain Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco

**Producer—Gas—**  
Mussens, Ltd.

**Prospecting Mills and Machin-  
ery—**  
Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

**Pulleys, Shaftings and Hang-  
ings—**  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

**Pumps—Boiler Feed—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Fraser & Chalmers, Ltd.

**Pumps—Centrifugal—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Thos. & Wm. Smith  
M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.

**Pumps—Electric—**  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.

Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll Rand Co., Ltd.

**Pumps—Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co. Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.

**Pumps—Turbine—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.

**Pumps—Vacuum—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.

**Quarrying Machinery—**  
Mussens, Ltd.  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

**Rolls—Crushing—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Fraser & Chalmers, Ltd.  
Can. Allis-Chalmers, Ltd.

**Roofing—**  
Paterson Mfg. Co.  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville

**Rope Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.  
Mussens, Ltd.

**Rope—Manilla and Jute—**  
Jones & Glassco  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**  
B. Greening Wire Co.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.

**Rubber—**  
Canadian Consolidated Rub-  
ber Co., Ltd.

**Runways, Hand Operated—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Samplers—**  
Canadian Laboratories  
Ledoux & Co.  
Milton Hersey Co.  
Thos. Heys & Son

**Screens—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
R. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
Jenckes Machine Co., Ltd.

**Screens—Cross Patent Flang-  
ed Lip—**  
Hendrick Mfg. Co.

**Separators—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

**Sheets—Genuine Manganese  
Bronze—**  
Hendrick Mfg. Co.

**Shear Legs—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Shovels—Steam—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
M. Beatty & Sons

**Slime Tables—**  
James Ore Concentrator  
Can. Allis-Chalmers, Ltd.

**Smelting Machinery—**  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**Stacks—Smoke Stacks—**  
Canadian H. W. Johns-Man-  
ville Co., Ltd.  
Hendrick Mfg. Co.

**Stamp Mills—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**Steel Drills—**  
Rock & Power Mach'y, Ltd.  
Sullivan Machinery Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Swedish Steel & Imp. Co., Ltd.

**Steel—Tool—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Can. Fairbanks-Morse Co.  
N. S. Steel & Coal Co.  
Swedish Steel & Imp. Co. Ltd.

**Surveying Instruments—**  
Peacock Bros.  
W. F. Stanley  
C. L. Berger

**Switchboards—**  
Can. Allis-Chalmers, Ltd.  
Northern Electric Co., Ltd.

**Tanks—Cyanide, Etc.—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.  
Jenckes Machine Co., Ltd.  
Hendrick Mfg. Co.

**Tramways—**  
Mussens, Ltd.  
B. Greening Wire Co.  
Can. A's-Chalmers, Ltd.

**Transformers—**  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Peacock Bros.

**Transits—**  
C. L. Berger & Sons  
Peacock Bros.

**Tractors—Oil—**  
Can. Fairbanks-Morse Co.

**Tube Mills—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.

**Turbines—**  
Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.

**Water Wheels—**  
Can. Allis-Chalmers, Ltd.

**Winding Engines—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.

**Wire Cloth—**  
Mussens, Ltd.  
Northern Canada Supply Co.  
B. Greening Wire Co.

**Wire (Bare and Insulated)—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co., of Canada, Ltd.

**Zinc Dust—**  
Roessler & Hasslacher.



# BRITISH COLUMBIA

## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$72,194,603; Lode Gold, \$70,859,022; Silver \$33,863,940; Lead, \$27,520,753; Copper, \$73,723,562; Other Metals (Zinc, Iron, etc.), \$1,528,403; Coal and Coke, \$132,871,155; Building Stone, Brick, etc., \$17,576,084; making its Mineral Production to the end of 1912 show an

## Aggregate Value of \$430,137,522

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1892, inclusive, \$81,090,069; for five years 1893-1897, \$31,420,396; for five years 1898-1902, \$77,218,073; for five years 1903-1907, \$109,797,744; for five years 1908-1912, \$130,611,240.

## Production During last ten years, \$240,408,984

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those in any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with mining Reports and Maps, may be obtained gratis by addressing

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**American Ore Reclamation Co.**

71 BROADWAY, N.Y.

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### The Steel with a Reputation

Has stood the test in Canada for Twenty  
years.

Manufactured by

**B. K. MORTON & COMPANY**

SHEFFIELD, England.

Full Stocks carried by

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Toronto: The Canadian B. K. Morton Co., Ltd.

Cobalt: The Canadian Rand Co., Ltd.

Victoria B.C.: E. G. Prior & Co., Ltd.

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to

**HON. E. H. ARMSTRONG,**  
Commissioner of Public Works and Mines,  
HALIFAX, N. S.

## LANDS OF THE ALGOMA CENTRAL & HUDSON BAY RAILWAY

### Opened for Prospecting

*Two thousand square miles of railway lands in the Lake Superior region that have been held in reserve during the construction of the A. C. & H. B. Railway are now open for public prospecting.*

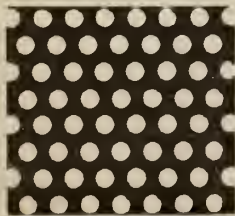
*No license is required; staking, recording and assessment work practically as on Government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. The lands are in alternate blocks with intervening areas of Government lands which are also open for prospecting. Two passenger trains daily through the district.*

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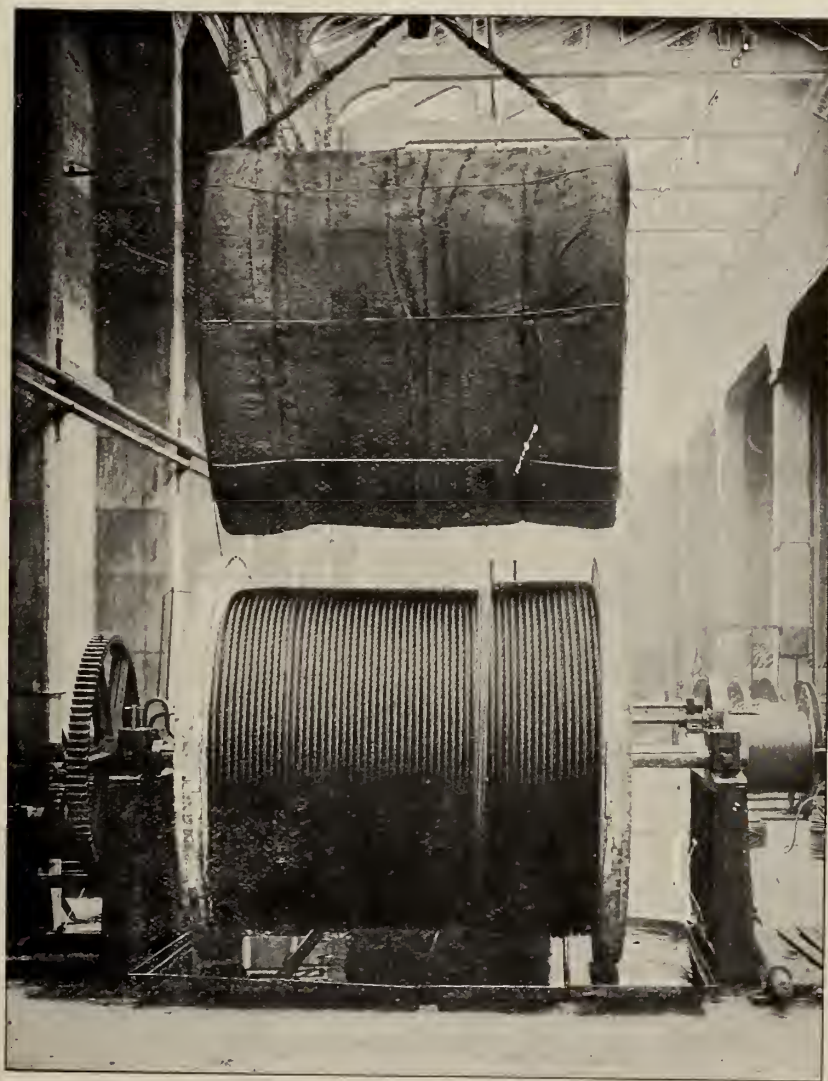
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VOL. XXXV

TORONTO

No. 21

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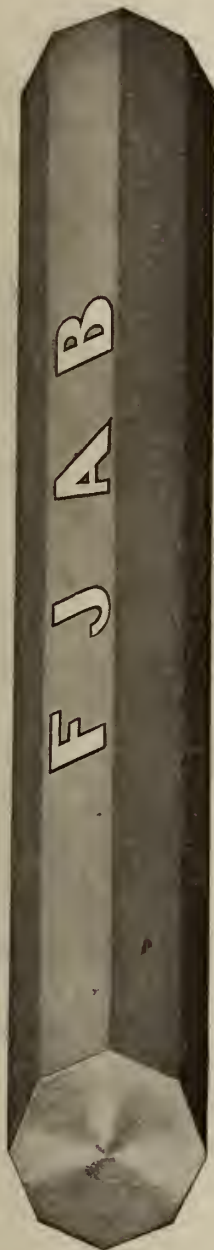
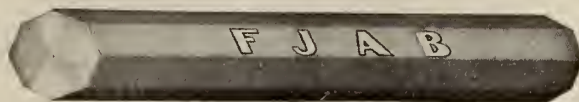
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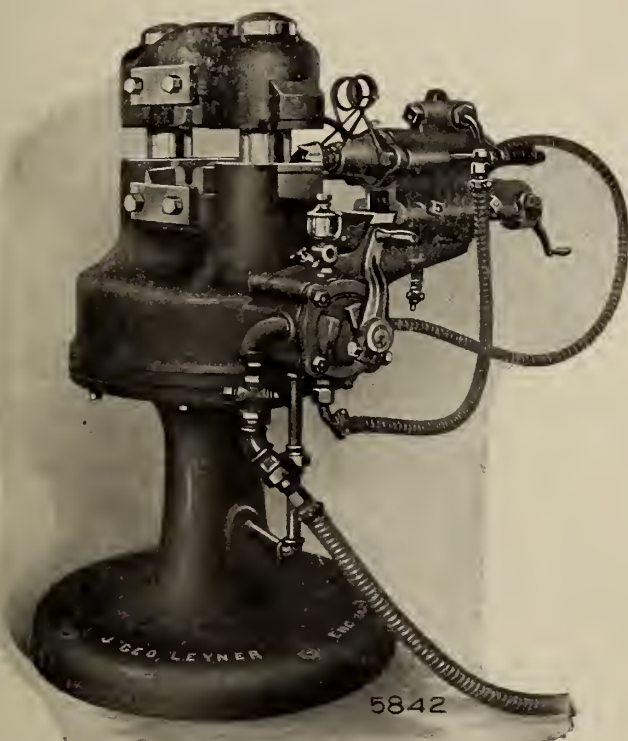
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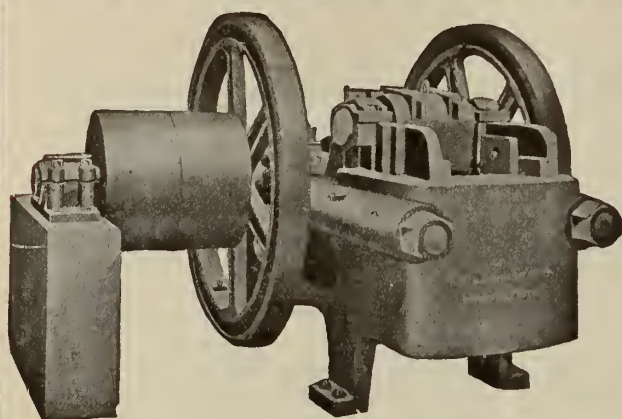
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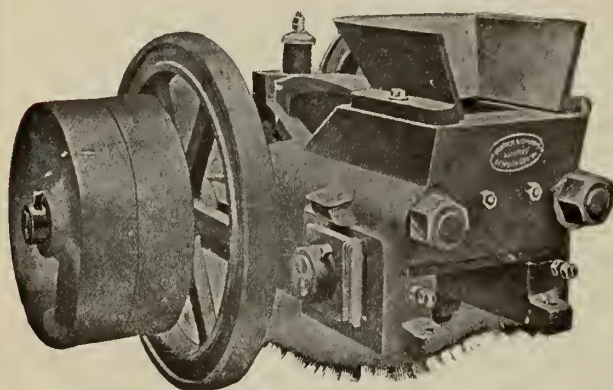
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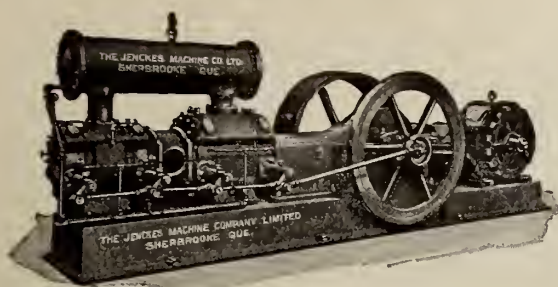
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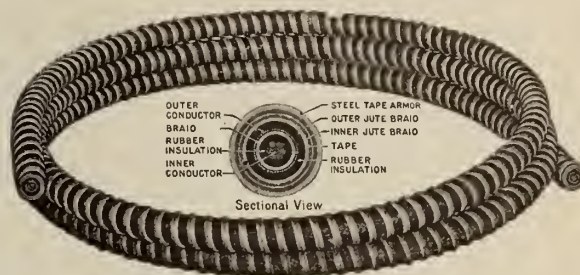
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Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

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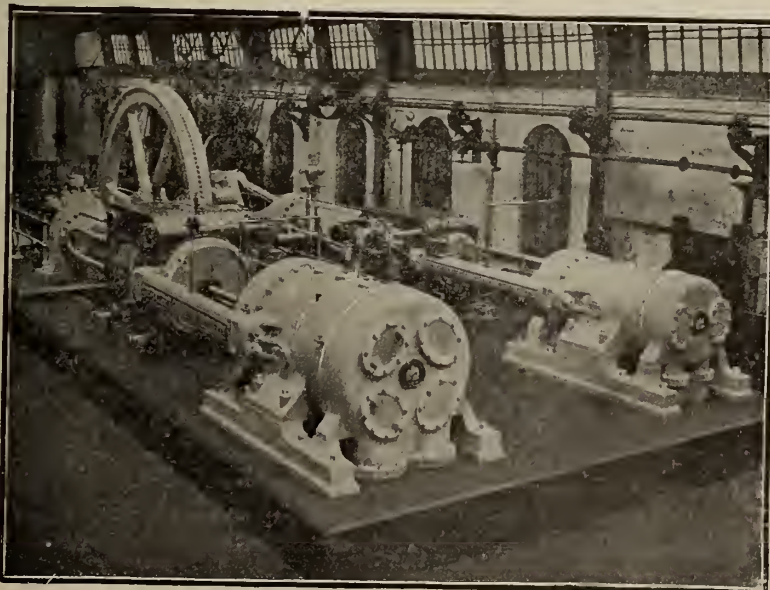
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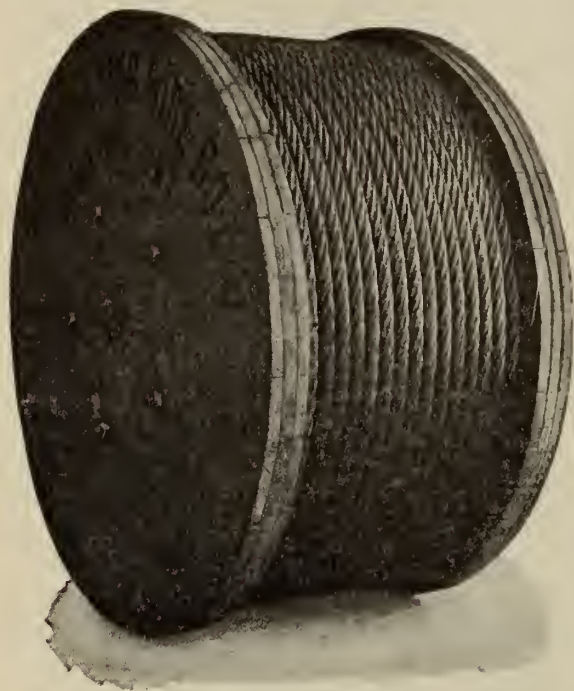
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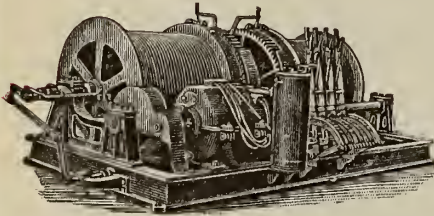
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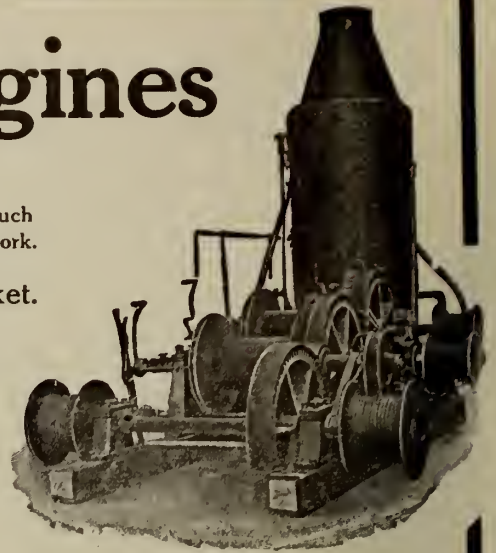
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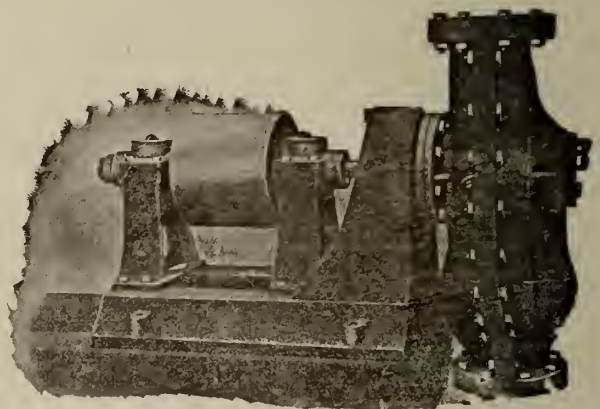
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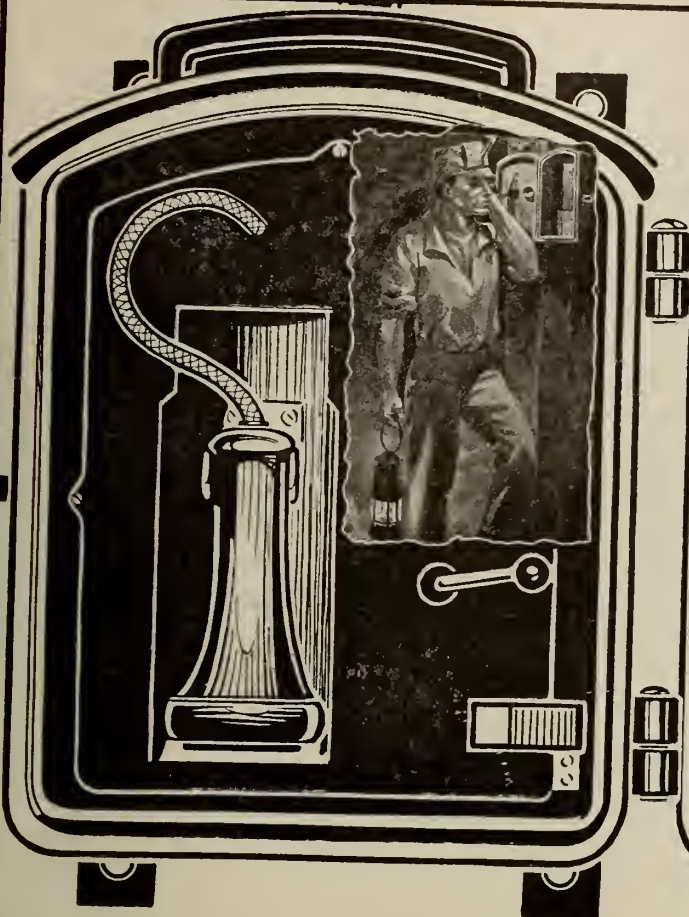
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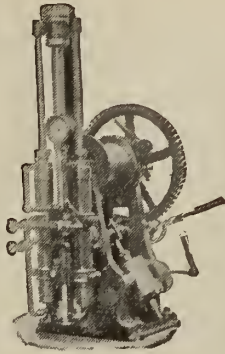
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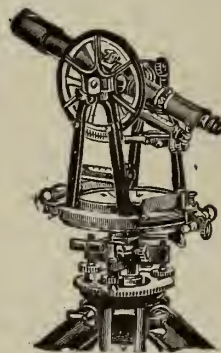
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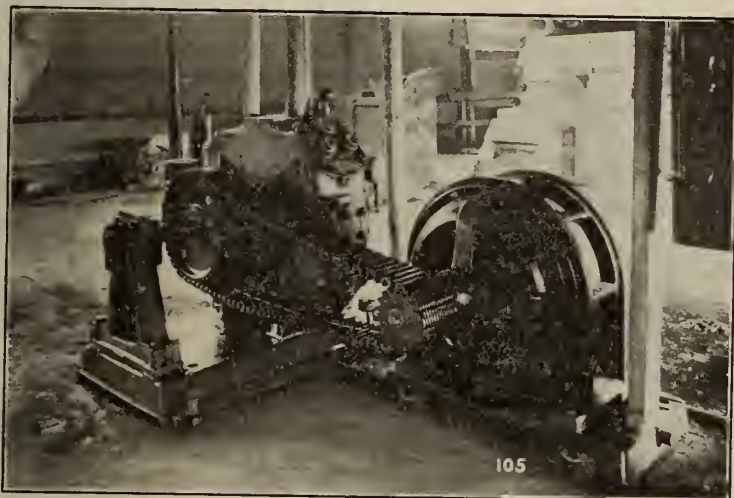
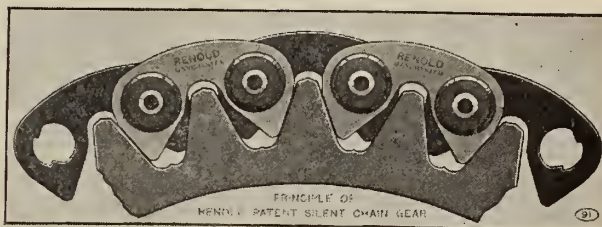
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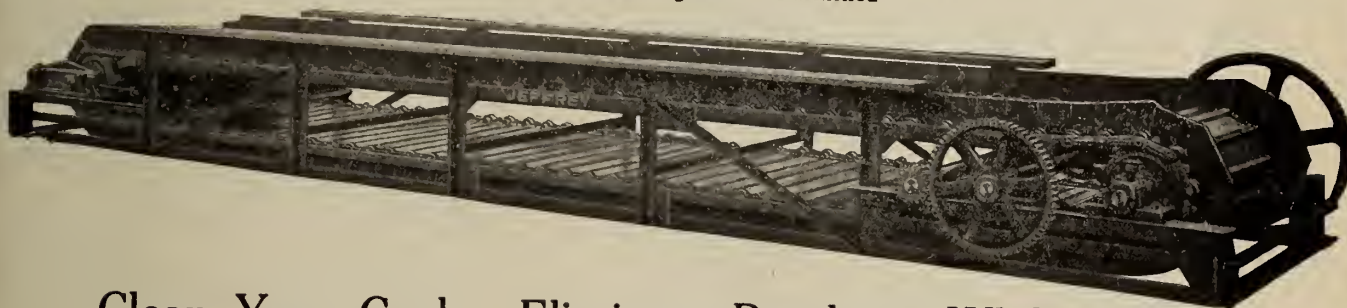
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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, November 1, 1914.

No. 21

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

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Editor

REGINALD E. HORE

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## GRANBY'S SMELTERS

The Granby Consolidated Mining Smelting and Power Co. is and has been for years one of the largest producers of copper. From its mines at Phoenix, B.C., the company has shipped over 10,000,000 tons of ore. The ore is treated in the company's smelter at Grand Forks, B.C., the largest copper smelter in Canada.

The Phoenix ore is low grade. In the year ending June 30th, 1913, there was treated 1,264,690 tons, yielding an average of 17.68 lb. copper, 0.208 oz. silver and 0.0326 oz. gold. The average smelting cost was \$1.214 per ton. For the year ending June 30, 1914, the records show a recovery of 16.89 lb. copper per ton of ore smelted.

That such ore can be mined and smelted profitably is very creditable to those who have been in charge of operations. The method of treatment is of great interest, and the careful description of plant and methods prepared by Mr. A. W. G. Wilson, of the Mines Branch, Ottawa, and reproduced in the Journal, will doubtless prove interesting to many readers.

While operations are carried on satisfactorily at Phoenix and Grand Forks, the company does not regard its ore reserves as inexhaustible by any means, and has in the past few years examined many mining properties in British Columbia with a view to taking up promising ones and providing a field for operations that will perpetuate the life of the company. Of the properties examined a few have been taken up. Of these the most important is the Hidden Creek mine on Observatory inlet, north of Prince Rupert. Here a large body of ore, much richer than the Phoenix ore, has been developed. To treat this ore a smelter has been built at Anyox, and is now in successful operation. This also is a smelter of large capacity, and our readers will be interested in the brief description of it written some time ago by Mr. Wilson; but only recently published by the Mines Branch. While the description has lost part of its interest owing to a long delay in publication, it is nevertheless an important contribution.

Supplementing Dr. Wilson's description, it may be stated that the plant at Anyox is now in successful operation. The first furnace was "blown in" in March. Mechanical troubles were encountered, as is usual with new plants. The process proved also not wholly satisfactory, and the output during the summer has not been as high as expected. Problems of an unexpected nature arose and added to the cost of treatment. It is stated, however, that there has been considerable improvement in the last few months, and that for October the output will be about 1,800,000 lb. cop-

per, and the cost of treatment lower than in previous months.

This improvement in yield and costs must be especially pleasing to Prof. Geo. Guess, head of the department of metallurgy of the University of Toronto, who has been for some time at Anyox in the capacity of consulting metallurgist. We congratulate him on his success.

## CANADIAN MINING SOCIETIES

There are in Canada two important mining societies: The Canadian Mining Institute, with numerous branches throughout the Dominion, and the Mining Society of Nova Scotia. The latter is, as its name implies, a Provincial Society, confining its interest largely to Nova Scotia.

Nova Scotia is and has been for years an important mineral producing Province. In Cape Breton occur the greatest coal deposits in Canada. The Province owes to the mining industry no small part of its development. Mining began early in the history of Nova Scotia, and has continued with marked success. Gold mining was for some years actively carried on; though it has of late years received little attention. The number of men engaged in the mining industry resulted naturally in a desire for a society devoted to the interests of mining and allied industries. And so the Mining Society of Nova Scotia came into existence.

In the other Provinces, notably in British Columbia, Ontario and Quebec, mining is also one of the leading industries. But these Provinces have no Mining Societies. Instead the mining men have banded together to form the Canadian Mining Institute. Why, then, should Nova Scotia stay out?

The reasons seem to be many. The chief seems to be that the Society is an old one and wishes to retain its identity. Attempts have frequently been made to sound the members on their willingness to have their Society merged into the Canadian Mining Institute. This proposition meets with little favor. The Nova Scotians are willing to be closely affiliated; but they cannot be prevailed on to give up their first love.

And so the problem is not an easy one. The Institute and the Society should be on closer terms. But what are the terms that will be satisfactory to both parties?

Recently the officers of the Society have explained to the members the terms offered by the officers of the Institute. We published this explanation in our last issue, and wish to call it to the attention of members of the two institutions.

## CONDITIONAL CONTRABAND

During the past month there has been plenty of evidence that Germany is obtaining war supplies from the United States and other countries by the simple expedient of importing through neutral countries.

That the enemy would attempt this was of course expected. The surprising feature is that he seems by devious means to have in several cases succeeded, owing to the difficulty of determining the ultimate destination of cargoes consigned to Holland, Denmark, Sweden and Norway.

That the authorities are on the alert is indicated by the seizure of vessels with cargoes of oil or copper consigned to neutral countries. In one case a copper cargo was diverted en route to Holland and purchased by the British Government. During the past two weeks three ships laden with oil have been taken by the British fleet.

The vessels carrying these cargoes are neutral vessels, and they were, when seized, on their way to neutral ports. That objection to their seizure would be made by the owners was to be expected, and objection has been made. The owners can put up a very plausible story, and it would be difficult for the Allies to prove that Germany is the real buyer of the materials. The British Government is not easily fooled, however, and places the onus of proof on the shipper and the authorities of the neutral countries to which the goods are consigned.

As an instance of the traffic in oil, it is asserted that Denmark merchants have during the past two months been buying enormous quantities, while before the war they were small buyers. The Scandinavian countries also have suddenly become large importers. The significance of this new business is easily understood when it is recalled that Germany is short of oil.

The significance of recent large shipments of copper to Holland is also plain. Naturally, United States producers are not submitting to their loss of the German market without a fight, and they have protested against seizure of cargoes. It has been announced that Sir Cecil Spring-Rice, British Ambassador, and Mr. W. J. Bryan, U. S. Secretary, have agreed to meet the situation by endeavoring to obtain from the Government of Holland official assurance that Holland will not import copper in excess of her own requirements. It will thus be possible to prevent copper reaching the enemy without at the same time interfering with the copper industry in Holland and the trade between that country and the United States.

The safeguarding of all legitimate channels of trade is of importance to the copper mining industry. The Allies are at present fairly large consumers, but with Germany out of the market the price has fallen uncomfortably low, and it is to be expected that companies operating on a small margin will suffer seriously until conditions become normal again.

Production at the copper mines at present is only about one-half normal. The effect of the curtailment is not immediate, however, owing to the fact that several weeks elapse between the time of mining the ore and its shipment from the refineries.



## SELLING SILVER

The early days of the war caused no little anxiety to the owners of silver mines and to their employees. No less seriously interested were the companies which buy the products of the mines and mills. It is now clear that there was some ground for fear that the industry would suffer; but fortunately it has not suffered very badly, not nearly so badly as many other industries.

When we examine into the cause of the stability of the industry in these trying times, we find that many things have contributed to bring about the satisfactory conditions. One of the first is that most of the companies are controlled by men who are not easily panic stricken. They have faith in the industry and in the Empire and a sense of obligation to their employees.

Immediately after war was declared the American firms who had previously purchased a large portion of the output of Cobalt silver mines refused to buy. They doubtless had good reasons for adopting this policy, as the output of silver by American mines has to be taken care of, and there was a possibility of shipments to Europe being interfered with.

The Canadian smelters, however, continued operations in spite of the rather dark outlook. The Coniagas Reduction Company and Deloro Mining & Reduction Company had courage when it was needed, and, as a result, have been able to keep their men at work and enable the mining companies to keep their men busy also. It is a pleasure to learn, therefore, that their policy has proven a profitable one, owing to the early resumption of buying orders from England.

Mr. Thomas Southworth, vice-president and general manager of the Deloro Mining and Reduction Company says with regard to the company's policy:

"We felt sure that despite the reported presence of German cruisers on the Atlantic shipping would not be interrupted for any length of time, and that there was likely to be a market for silver in the near future, and results have justified our action.

"While the market for silver is restricted and our sales of cobalt to Europe ceased entirely, we have been able through the co-operation of the mine owners and the good feeling of our employees, who themselves suggested and accepted a reduction in salaries and wages till the war is over or until normal conditions are restored, to take care of a very large part of the output of the camp and keep the mines open without any serious loss to ourselves."

Another factor which was of great aid in preventing the closing of mines owing to lack of market was the prompt action of the Government in arranging that the banks should advance money on silver bullion. Even though buying orders be temporarily discontinued, the mining companies will thus be enabled to continue operations with some regularity.

The British Government has, since the war broke out, made purchases of silver that have helped to stay the market. The price has dropped owing to the fact that the usual buying orders for the East have been lacking. When the war risks are minimized a movement of silver to India and China may be expected. When this occurs a rise to normal prices should not be long delayed.

When the buyers of silver ore sent notice to companies at Cobalt that they would receive no more ore, the condition of those companies which ship to Canadian smelters or produce bullion at Cobalt became enviable. Among the latter, the Nipissing Mining Co., by virtue of its high grade plant, was shown to be in a strong position. The Nipissing company sends out a large part of its silver in the form of bullion, ready for the market. This independence of the smelters enabled the company to take immediate advantage of London buying orders. The management of the Nipissing and La Rose mines have adopted a policy for war time that is very creditable and will, we hope, prove profitable.

## THE WAR AND EUROPEAN COAL-FIELDS

By F. W. Gray.

It may have escaped general attention that the Germans in their occupation of Belgium and Northern France have become temporarily possessed of all the important coalfields of Western Europe. The district between Mons, Charleroi and Liege contains some of the most important collieries in Europe, and to the north is the comparatively newly developed coalfield of the Belgian Campine. In Northern France the Valenciennes field is in the hands of the invader, and it is more than probable that the Germans are going to make their stand against the Allies on a line that will run through the Valenciennes field, and that once again we shall hear of bloody fighting around the collieries of Mons, Binche, Charleroi, Huy and Seraing. One of the war correspondents has remarked that fighting in a colliery district is attended with great difficulties, and it may be easily seen that colliery buildings, solidly constructed as they usually are, shafts and concrete air-conduits, and colliery spoil-heaps offer many novel possibilities both for offence and defence. But the devastation which will be caused to the coal-mining industry and the poverty which will fall alike upon capitalist and miner is pitiful to contemplate. Perhaps when the victorious Russian marches through the coal district of Silesia, accounts may be balanced as between the invaders and their victims.

It would seem that there were reasons which made it convenient for the Germans to violate Belgium neutrality other than the cynical excuse of "military necessity" given by Herr von Jagow. In 1870 Germany acquired valuable iron-ore fields by the cession of Lorraine, and in invading Belgium and Northern France in the present struggle it was doubtless the aim of the Germans to permanently occupy Belgium and Northern France, thus incorporating within the Kaiser's dominions all the important coalfields of central and western Europe, and the valuable iron-ore



fields which since 1870 have been discovered in French Lorraine. Thus France would be permanently deprived of her best deposits of coal and iron, and the magnificent collieries and machine-shops of Belgium would help to make more guns for the Teuton.

Surely no person is to-day so unsophisticated as to believe that Germany had any other intention than to steal the Belgian's country, because of its suitability for German purposes and aims. Had the present occasion not arisen as it did, another occasion would have been made, because, as von Bernhardt grimly remarks, when political contingencies can be made to coincide with military readiness it is a suitable moment to commence war. The assassination of the Archduke Ferdinand was the political contingency, the German General Staff had the machine ready, and Antwerp's docks, Cockerill's works, the coalfields of Belgium and the Pas de Calais were the tempting prizes, to be had apparently for the mere taking.

It is unnecessary to dwell on the events which have hindered, and will eventually utterly frustrate Germany's attempted theft from a weaker neighbor; but it is equally unnecessary and extremely nauseous to listen to German apologies for her actions in Belgium. Germany wanted Belgium—wanted it badly—so she took it, and, if she can, Germany will keep Belgium, Northern France and the remainder of Lorraine; because coalfields, iron ore deposits and harbors on the North Sea are useful things, and are worth the bones of many Pomeranian Grenadiers.

## METAL PRODUCTS AND IMPORTS

Although the present war was primarily a quarrel between Continental powers, it has developed into a war for the existence, integrity and supremacy of the British Empire, involving the question of ocean transportation and overseas trade.

Germany has built up a great industrial system at home and a vast overseas commerce. Her foreign trade has increased from \$1,678,780,000 in 1893 to about \$5,000,000,000 in 1913. Under present war conditions she has lost, temporarily, nearly all this trade and it must be filled from other sources.

In 1913 Canada imported about \$14,475,000 worth of goods from Germany and \$1,525,000 worth from Austria. Our first duty is to produce, in so far as possible all goods imported from Germany and from Austria, and to purchase from Great Britain and other parts of the Empire what we cannot supply ourselves.

The next step is to set out to supply a large part of the goods exported by Germany to other countries.

The following tables give a summary of the value and classes of metal and mineral products imported in 1913-14:

Acids and salts of acids .....	\$ 456,346
Earthenware and chinaware .....	300,595
Electrical apparatus .....	204,388
Glass and manufactures of .....	276,221
Metal, minerals, manufactures of .....	3,514,949
Paints and colours .....	199,937

\$4,952,436

### Acids and Salts of Acids.

Year ending March 31st, 1914.

	Amount.	Value.
	Lbs.	
Acids. ....		\$25,152
Alum (in bulk) .....	1,856,802	22,001

Aniline and coal tar dyes	1,354,928	223,871
Antimony salts .....	1,179	157
Arsenic sulphide .....	17,720	891
Chloride of lime and hypochlorite of lime .....	444,475	4,316
*Potassium cyanide, sodium cyanide and cyanogen bromide .....	1,715	204
Potassium bichromate ...	12,120	808
Muriate and sulphate of potassium. ....	4,145,948	74,227
Potassium nitrate .....	560,700	25,708
Potassium prussiate .....	59,109	7,259
Sal-ammoniac. ....	297,069	14,834
Sodium bichromate .....	41,501	2,373
Sodium nitrate .....	229,774	8,568
Sodium sulphide .....	293,065	3,644
Tartaric and crystals ...	184,700	42,333
Total. ....		\$456,346

\*The total imports in 1914 amounted to \$243,907. Of this amount \$142,997 was imported from the United States and \$100,706 from the United Kingdom.

### Electrical Apparatus.

Carbons, electric light, and carbon paints. ....	\$ 43,308
Electrical apparatus, insulators electric batteries, telegraph and telephone instruments .....	141,252
Electric motors, generators, etc. ...	15,700
Other electrical apparatus .....	4,128
Total. ....	\$204,388

### Metal and Minerals and Manufactures of

Brass and manufactures of .....	\$ 130,389
Copper and manufactures of .....	52,206
Gold, silver and aluminum leaf, Dutch or Schlag metal leaf .....	31,359
Other gold, etc. ....	27,244
*Iron and steel manufactures of ..	2,824,900
Lead and manufactures of .....	10,441
Tin and manufactures of .....	29,763
Zinc and manufactures of .....	108,736
Miscellaneous metals and minerals and manufactures of .....	299,911
Total. ....	\$3,514,949

\*The principal iron and steel manufactures of ore are as follows:

Iron and steel in sheets or rolled shapes. ....	\$ 132,294
Billets of iron and steel .....	68,728
Ferro-silicon, spiegeleisen and ferro-manganese. ....	194,999
Cutlery. ....	379,890
Total machinery .....	252,689
Locomotive tires and car wheels (steel in the rough) .....	348,059
Tubing. ....	291,243

An examination of the above tables will show the relative value of the mineral products and manufactures imported, and a study of conditions will indicate whether they may be produced in Canada or not.

W. J. D.



# GRANBY COPPER SMELTING PLANTS AT GRAND FORKS AND ANYOX, B.C.\*

By A. W. G. Wilson.

Granby Consolidated owns 1,100 acres of mineral lands in the Phoenix camp of the Yale mining division, and 61 acres of land, containing a limestone quarry near Grand Forks, all being in British Columbia. Property ownership includes one hundred town lots in Phoenix and Grand Forks. The company also owns a large smelter site about a mile from Grand Forks. The ownership of all the capital stock of the Hidden Creek Mining Company gives the Granby Company virtual ownership of considerable areas of mineral lands, a smelter site, and the townsite of Anyox at Granby bay, on Observatory inlet, about 110 miles from Prince Rupert. The company also owns about 5,000 shares of Crow's Nest Pass Coal Company's stock.

The following descriptions of the smelting plants were written before the Anyox smelter was in operation. Through the courtesy of the Traylor Engineering and Manufacturing Company, it has been possible to include a brief description of the new furnaces and converters built for the Anyox plant.

## Granby Smelter, Grand Forks, B.C.

This smeltery is located about three-fourths of a mile from the town of Grand Forks, Grand Forks mining division, British Columbia. It is situated in the valley of the North fork of the Kettle river on a bench standing about 100 ft. above the river level. This location is about 24 miles from the mines at Phoenix, the chief source of the ore supply, and about 3,000 ft. below it. The works are served by both the Canadian Pacific and Great Northern railways.

The plant was built primarily to reduce the ores from the company's own mines at Phoenix. The original plant, consisting of two furnaces, 44 in. by 160 in. at the tuyeres, with water power and dam, was built in the years 1899 and 1900 and blown in August 21, 1900. These furnaces were hand charged from a car extending their whole length and feeding from the side. The capacity was 700 tons per day. The slag was granulated, and the matte containing 50% to 60% copper was shipped to the refineries of the Nichols Chemical Co. near New York. The operation of this plant was so successful that plans for two similar furnaces and a converter plant were prepared. These furnaces, numbers 3 and 4, and three converter stands, 72 in. by 100 in., were installed and in operation in 1902. At this time additional power was obtained under contract from the Cascade Power Co., operating on the main branch of the Kettle river, 10 miles below Cascade, B.C. Blister copper 99% pure was consigned to New York; converter slag was returned to the blast furnaces.

In the year 1904 furnaces No. 5 and 6, similar to the others, were added. At this time the system of end charging, designed by Mr. A. W. Hodges, the then local manager, was introduced, changing from hand feed to mechanical feed.

In 1905 furnaces Nos. 7 and 8, 48 in. by 213 in. at the tuyeres, were erected. These furnaces were designed to make a higher grade matte than was ordinarily obtained in the earlier furnaces. The bosh was

increased and carried directly to the bottom of the furnace, the width at the tuyeres was increased and the tuyeres of the new furnaces were 3.5 in. in diameter, set at 8 21/32 in. centres, instead of 5 in. tuyeres set at 17.75 in. centres, as on the old furnaces. By the end of 1906 all the furnaces were enlarged to this size. At this time the capacity of the plant was 3,000 to 3,500 tons of Granby ore per day. Additional power was obtained from the Bonnington Falls power plant. In this year the Great Northern railway was built into both mines and smelter. No further enlargements took place until 1909.

In 1909 six of the furnaces were enlarged to 260 in., and Nos. 7 and 8 to 266.5 in. in length, and were all made 4 ft. deeper, increasing the ore column from 9 ft. to 13 ft. Two of the old converter stands were also taken out and three 84 in. by 126 in. electrically operated converters installed in their place. These new furnaces have a capacity of 4,000 to 4,500 tons of Granby ore per day with cleaner slag and less fuel. The actual tonnage treated averages less than 4,000 tons per day. The converter capacity is 100,000 lbs. of copper per day.

During the period of expansion of the blast furnace and converter departments of the work, the other departments tributary to these were correspondingly enlarged by the addition of new equipment. The storage bin capacity was increased from 1,000 tons in 1900 to 9,000 tons of ore and 7,000 tons of coke in 1907; new rotary blowers and blowing engines were added; a new steel flue dust chamber with mechanical dust conveyor in part replaced the old brick chamber; the slag dump had become so large that it became necessary to substitute a haulage system; the early wooden buildings were replaced by steel, or steel and brick structures; additional power was procured from the Bonnington Falls plants.

**Present Equipment.**—The plant, as it now stands, consists of 8 blast furnaces, six 48 in. by 260 in., and two 44 in. by 266.5 in., and a converter equipment of three electrically operated converter stands, 84 in. by 126 in. with 10 shells. The blower department is fully equipped to supply both blast furnaces and converters. Ample storage capacity for ore and coke is provided; an efficient haulage system and a new plant for distributing and disposing the slag have been installed. The works are served by shops fully provided with tools for making all necessary repairs and for executing designs of new equipment. There is a small power plant, a pumping and fire protection system, a sample mill, and an assay laboratory. The plant as a whole is capable of handling 4,000 to 4,500 tons of Granby ore per day, and of producing 50 tons of copper. It is well laid out, is easily operated, and on the whole is provided with good machinery and good buildings.

**Power.**—The power used in operating the works is wholly electric. The company's own power plant on the North Fork of the Kettle river is capable of generating about 400 h.p., the balance of the power needed is obtained from the lines of the West Kootenay Power and Light Co.

\* (Extract from report on copper smelting industries of Canada, published by the Mines Branch, Ottawa).



The company's power dam is located about a mile above the smelter. This is a rock filled crib dam, 12 in. by 12 in. timber; it is 65 ft. in length, 127 ft. in width, and 26 ft. in height. It backs the water to form a lake of 600 acres. The 9 ft. by 11 ft. flume leading to the power house is 5,600 ft. in length, and has a fall of 0.03 ft. per 100 ft. It delivers water to the wheels under a 45 ft. head.

The power house is a wooden structure, 22 ft. by 168 ft., placed about 100 ft. lower than the smelter and 1,000 ft. away. The installation includes three 180 k.w. alternating current generators, each direct connected to two 16 in. American turbine wheels, generating current at 440 volts; one 180 k.w. alternating cur-

operated oil break switches, lightning arresters, etc., are manufactured by the Canadian General Electric Co. When this installation is complete there will be two banks (six transformers) 1,250 k.w. each, 60,000/440 volt, oil insulated water-cooled transformers.

The No. 3 power plant is connected with two 3-phase 60 cycle, 22,000 volt lines to the Grand Forks sub-station. The equipment at this sub-station consists of one bank (three transformers) 312.5 k.w. each, 20,000/500 volt transformers, oil insulated, natural cooled, together with its switchboard apparatus, Westinghouse manufacture.

Power for use in the works may be taken from either plant.

**Receiving Ores.**—Ores are received over the lines of the Canadian Pacific and Great Northern railways. Each has its own yard, but the yards are connected by cross-overs. A switch engine is maintained jointly by both roads to handle all ore, coke, and freight passing through either yard.

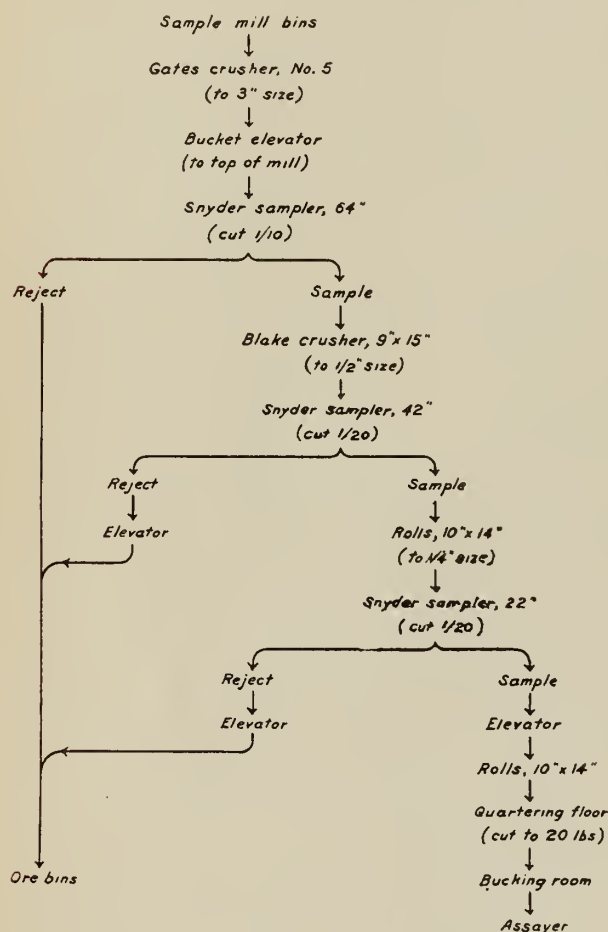
A scale house between the yards and the ore and coke bins is so placed that the scales are easily accessible to both yards and bins. This house covers one 36 ft. and one 50 ft. 80-ton track scales. All cars are weighed in and empties are weighed out. These scales are inspected by a Dominion Government inspector every three months.

The ore bins are located on a terrace east of the main works and at a higher elevation. The ore cars are run from the yards to track over the bins. There are five sets of storage bins, built of wood, parallel to each other and 756 ft. in length; they are built high enough for the charge cars to pass beneath to be loaded by gravity. The dimensions and capacity of these bins are as follows: No. 1 ore bin, 20 ft. high, 17 ft. wide, bottom slope 45 deg.; No. 2 coke bin, 25 ft. high, 17 ft. wide, bottom flat; No. 3 ore bin, 25 ft. high, 20 ft. wide, bottom slope 45 deg.; No. 4 coke bin, 25 ft. high, 20 ft. wide, bottom flat; No. 5 ore bin, 25 ft. high, 20 ft. wide, bottom slope 45 deg.

The bottoms of the bins are made of two thicknesses of 2 in. plank. It will be noted that the coke bins are arranged alternately with the ore bins; the loading chutes from parallel sets of ore and coke bins open to the same line of track greatly facilitating the loading of the charge cars. The capacity of the ore bins is 12,000 tons; in addition there are bins holding 5,300 tons at the sample mill, giving a total ore storage capacity of 17,300 tons. The coke bins are of 7,000 tons capacity; yard storage of an additional 12,000 tons of coke is also provided.

**Sample Mill.**—The metal content of the ore is very uniform and very careful sampling is not required. The practice is to send about one car in ten to the sample mill bins; this is recrushed and sampled automatically in 1,000 ton lots. There are two Snyder Automatic sampling mills, built of wood, placed 35 ft. from the receiving ore bunkers. No. 1 mill, 64 ft. by 50 ft., has a bunker capacity of 500 tons and samples only Granby ore and the less siliceous ores. Two additional sets of storage bins, used chiefly for storing custom ores, are also provided near the mill. The flow sheet of the mill sampling custom ores is shown in the accompanying illustration. The equipment of the other mill is similar.

Granby ores being very uniform are left as coarse as is consistent with accurate sampling; siliceous ores, some of which are required for converter linings, are crushed to less than half inch size. In both mills the first crusher is a Gates gyratory crusher reducing the



**Flow Sheet of sample mill No. 1, Granby Consolidated Mining and Smelting Co.**

rent generator, similarly connected, generating current at 2,200 volts for transmission to Grand Forks; and one 22.5 k.w. direct current generator, direct connected to a 10 in. turbine wheel, generating current at 125 volts for excitation and lighting. There is also a 13 in. turbine wheel driving two 40 h.p. triplex pumps. All the switchboards and meters necessary for this plant are also placed here.

Power from the No. 2 plant of the West Kootenay Power & Light Co. reaches the transformer station at Grand Forks over two 3-phase, 60 cycle, 60,000 volt lines. At this station it is stepped down to 440 volts, the voltage for which all the motors in the works are designed. The transformer station for these lines is equipped with two banks (four transformers) 1,250 k.w. each, 60,000/440 volts, oil insulated, water cooled transformers, manufactured by the Canadian Westinghouse Company. All switchboard apparatus, motor



ore to 3 in. size; it is then elevated to the top of its respective mill. From this point the treatment is different except that Snyder samples cutting one-twentieth are used in both mills.

Granby ore is cut at the top of the mill, the discards and all subsequent discards pass to storage bins and thence directly into charge cars; the sample passes to a Blake crusher which reduces to 0.5 in. size. The sample then successively passes a Snyder sampler, rolls set at 0.125 in., a third Snyder, and thence to the quartering floor, from which a 20 lb. sample is sent to the bucking room.

In the siliceous ore mill where the ore requires to be finely crushed, two separate operations take place. The sample first cut passes to a storage bin that receives the whole initial sample from a shipment. The discards pass over a half-inch grizzly to a crusher and two sets of rolls, reducing to half inch size, all the crushed ore being then elevated to receiving bins, the samplers being idle meanwhile.

When the first discards have been treated and stored the chute of the sample bin is opened and the sample undergoes a similar treatment and is cut after each reduction in size; the sample from the last roll is split on a 1 in. riffle, and then quartered by hand. The mill has a capacity of 40 tons per hour.

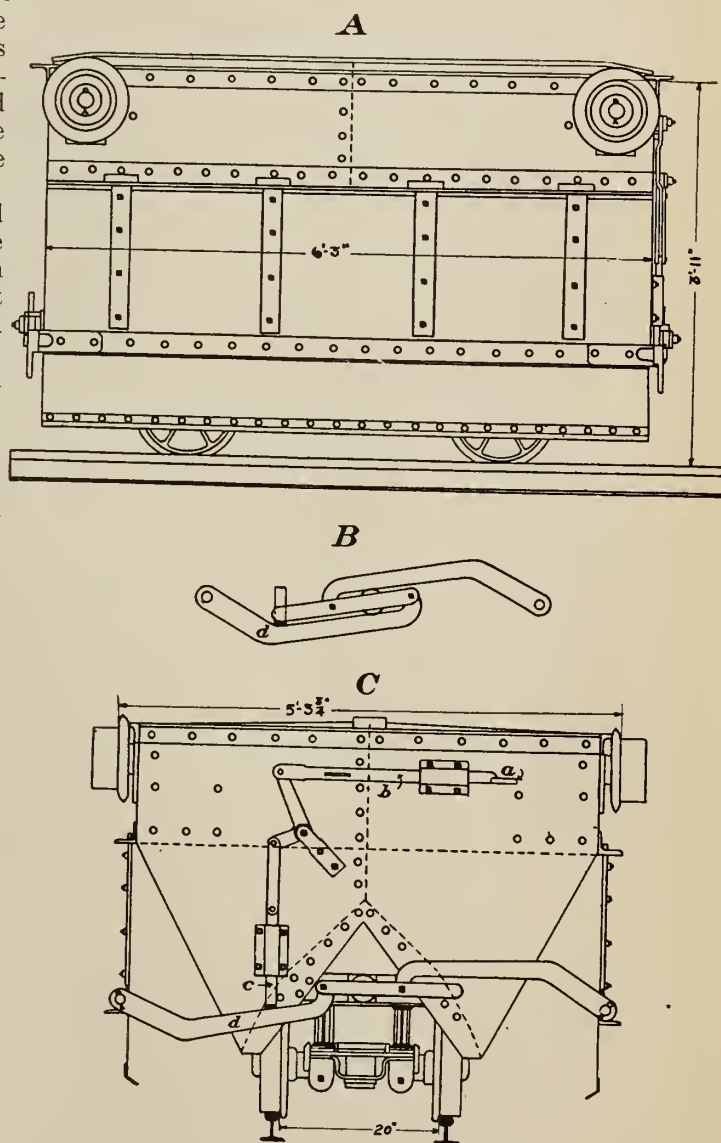
**Haulage and Distributing System**—A system of tram car trucks, 20 in. gauge and 30 lb. rails with cross over switches, is laid on the charging floor level; these tracks run beneath the bins, the chutes of which are placed 6 ft. above this level, and lead to the furnaces.

The charging cars are designed specially for feeding the furnaces from the end. As shown in end view these cars are divided longitudinally into wedge-shaped sections, each closed by a side door which is hinged at the top; the wedge-shaped ridge which covers the truck of the car serves to spread the charge in the proper place along each side of the furnace. A transverse partition further divides the car into four compartments. The cars are provided with two sets of wheels. The lower or truck set are for ordinary locomotion over the charging floor tracks; the upper set, one wheel being placed near the corner of each car, engage in pairs with heavy rails set in the inside of the furnaces in the walls, and carry the load while the cars are in the furnace. The rails on the charging floor end at the mouth of the furnace, but as a car leaves the floor rails the hanger wheels engage with the sloping ends of the furnace rails and so the car passes into the furnace. When the cars are completely inside of the furnace the feeder by means of a long hook, inserted at A (Fig. C) pulls the release arm b. This in turn raises rod c and lifts gate arm D over centre unlocking the side doors, and the weight of the load then opens the doors, permitting the charge to drop into the furnace. The gate arms are shown closed in Fig. B and open in Fig. C and d. To facilitate discharging, the locks of the cars are chained together so that they will dump simultaneously. A train can be backed into a furnace, discharged, and pulled in 10 to 20 sec. The hoppers are closed after the train of cars is withdrawn from the furnace.

A charging train consists of three charge cars (whose combined length is just equal to the length of a furnace) and a 30 h.p. Westinghouse electric locomotive for hauling; one train serves two furnaces.

A slag haulage system was installed at the plant and was in use for a number of years. Each furnace was served by six slag cars 44 cu. ft. capacity each, three being used on each side of the small settler. These

cars were handled by 14-ton Davenport steam locomotives, cylinders 9 in. by 14 in., one engine handling slag cars from two furnaces six cars at a trip. Six engines and 52 slag cars were required for this service. This system was discontinued in 1911, when a special equipment for distributing granulated slag was installed. This system was subsequently modified by discontinuing the use of the transverse distributing belt carried on the high trestles, and a new type of distributor was designed. A second unit with the incline rising to the opposite direction to that in the original system has recently been installed.

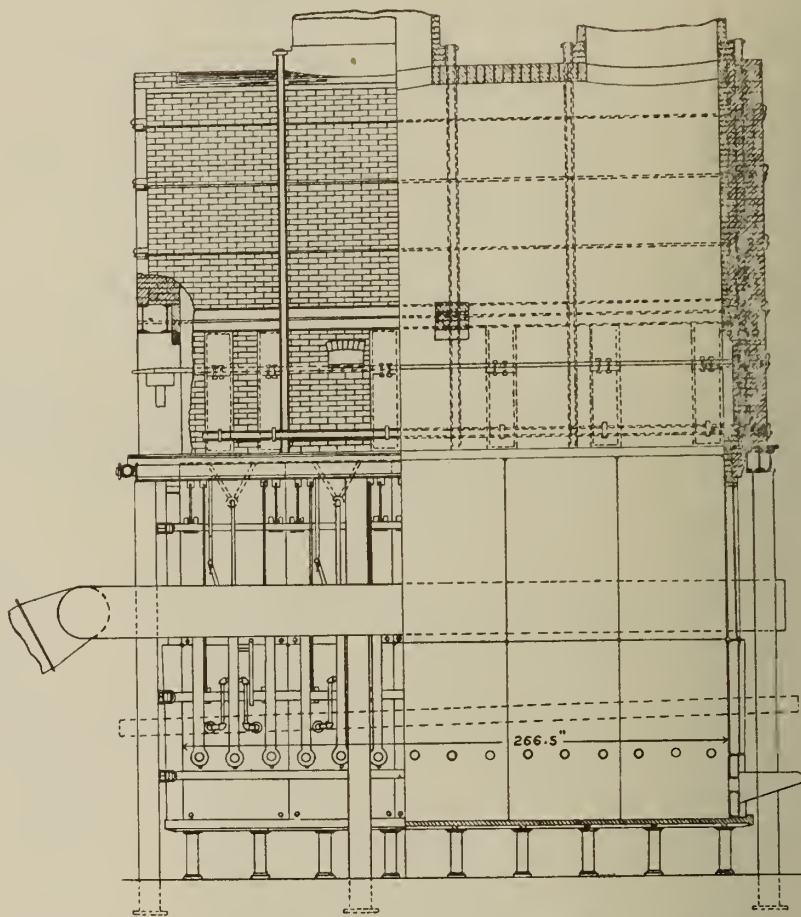
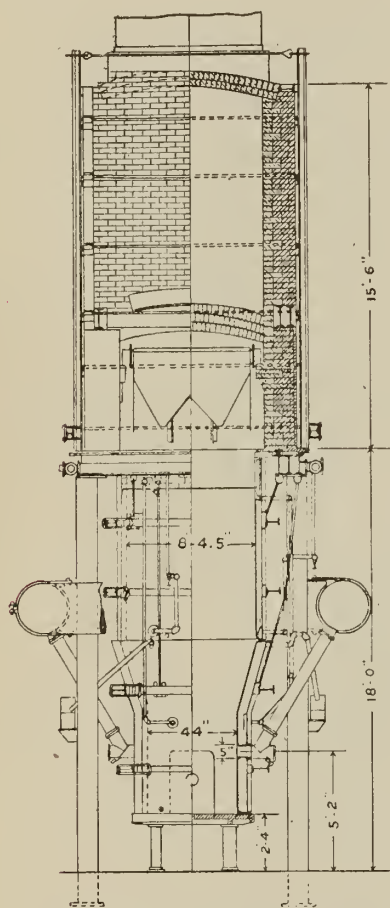


Charge Car, Granby Consolidated Mining and Smelting Co.

Granulated slag is now delivered to special drainage bins; the hoppers of these bins discharge to a belt 30 in. in width, running under the bins and extending for 40 ft. beyond them on each side. This belt can be driven in either direction to feed the belt on either incline. The conveyor to the north lifts the slag up an 18 deg. incline to a height of 120 ft. above the older dumps, where it delivers to a distributing car described below. The new conveyor to the south has an inclination of 18 deg. 26 min. and runs over 36 in. pulleys set 317 ft. centre to centre; the top is only 60 ft. above the old dumps. Special distributor cars receive the slag at the tops of the respective inclines, and deposit it where



required within a limited radius. The car on the older incline is 40 ft. in length, and carries a 24 in. belt. The car can be made to extend forward 20 ft. in front of the rails. It is pushed forward, as required, by a jack having a maximum extension of 3 ft.; it is held in place when discharging by being clamped at the heel to the 56-lb. rails on which it runs; the car may also be swung from side to side as required. The belt is longer than the car and extends below it to a tightener. As the car is projected forward new sections will be built in at the rear. The newer car on the south incline is similar to that on the north, except that it carries a 30 in. belt.



**Copper Blast Furnace, Granby Consolidated Mining and Smelting Co., Grand Forks plant. (After Lathe.)**

By distributing the slag in this way the granulated slag will be spread over the present dumps to a depth of over 100 ft. The capacity of the north incline is about 5,000 tons of slag per day, or about 3 tons per minute. The capacity of the south incline is somewhat larger.

**Flue System, Stacks.**—The eight furnaces are each provided with uptakes 6 ft. in diameter, with dampers, which can be raised if needed; these are seldom used. They are also provided with 6 ft. downtakes leading to an overhead steel flue-dust chamber paralleling the furnace building. This flue is 12 ft. above the feed floor, it is 19 ft. wide, 15 ft. high, 313 ft. 7 in. long; it is built of 3/16 in. and 5/16 in. steel plates. It has 28 hoppers in the bottom in which the flue dust collects. The dust is discharged through 9 in. openings into a trough kept clean by a wire rope drag conveyor. One end of the steel chamber connects to a brick flue 10 ft. by 15 ft. by 448 ft. leading to a brick stack 13 ft. in diameter and 153 ft. high. The other end also connects with a brick dust chamber, 10 ft. by 10 ft. by 340 ft.,

leading to a square brick stack, 11 ft. by 11 ft. by 153 ft. The converters are connected by downtakes with this latter flue. A partition in the main steel flue prevents an undue amount of furnace gases passing to either stack. The brick flues or chambers are provided on either side with hand doors at 6 ft. centres, through which the flue dust can be raked out.

**Buildings.**—The principal buildings on the property are of fireproof construction, steel, or brick and steel. The ore bins, the sample mill, and the various shops of the mechanical department are of wood. The furnace building is of steel, with roof and sides of corrugated

iron, 71 ft. wide, 289 ft. in length, and provided with a leanto 9.5 ft. wide and 12 ft. in height. It contains eight rectangular water-jacketed blast furnaces, each placed with its longer horizontal axis at right angles to the longer axis of the building. The average distance, centre to centre, of the furnaces is 36 ft.; the height from furnace floor to feed floor is 18 ft.

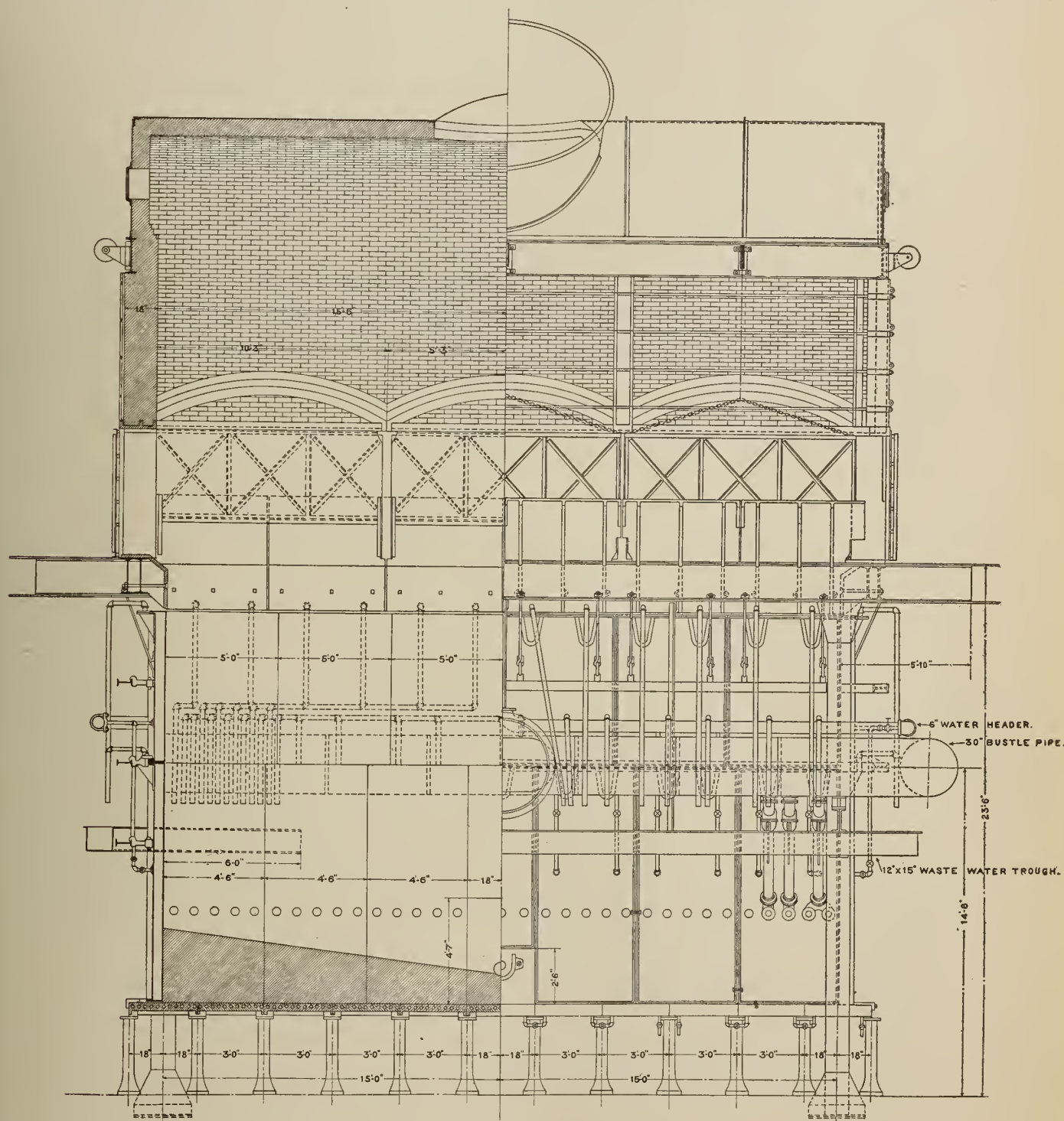
The converter building lies end to end with the furnace building, it is of steel construction with corrugated iron roof and sides. The main building is 42 ft. wide, and 240 ft. in length; the east leanto is 23 ft. wide, and the west leanto 32 ft. in width.

There are two buildings for housing the blowers. No. 1 lies north of the furnace building; it is a steel building with brick walls, a concrete floor, and corrugated iron roof, 57 ft. by 128 ft. 9 in. The main blowing engine building is placed back of the converter building. It is of steel, with brick walls, concrete floor, and corrugated iron roof. The main building is 55 ft. 4 in. by 212 ft. 9 in.; it is provided with an L 41 ft. 2 in. by 73 ft.



**Shops.**—The mechanical department of the plant includes the following buildings: machine shop, boiler shop, blacksmith shop, engine roundhouse, store room, and electrician's workshop. All are of wooden construction; on the whole they have been found too small for the needs of the plant.

from 215 in. to 12 in.; one bolt cutter; one small pipe machine; two power hack saws; one hydraulic wheel press 40 tons pressure. The boiler shop is 40 ft. by 50 ft. It contains a Whiting punch, No. 6, 13/16 in. hole through 3/4 in. steel plate; air tools such as rippers and hammers; one power shears for cutting steel plates;



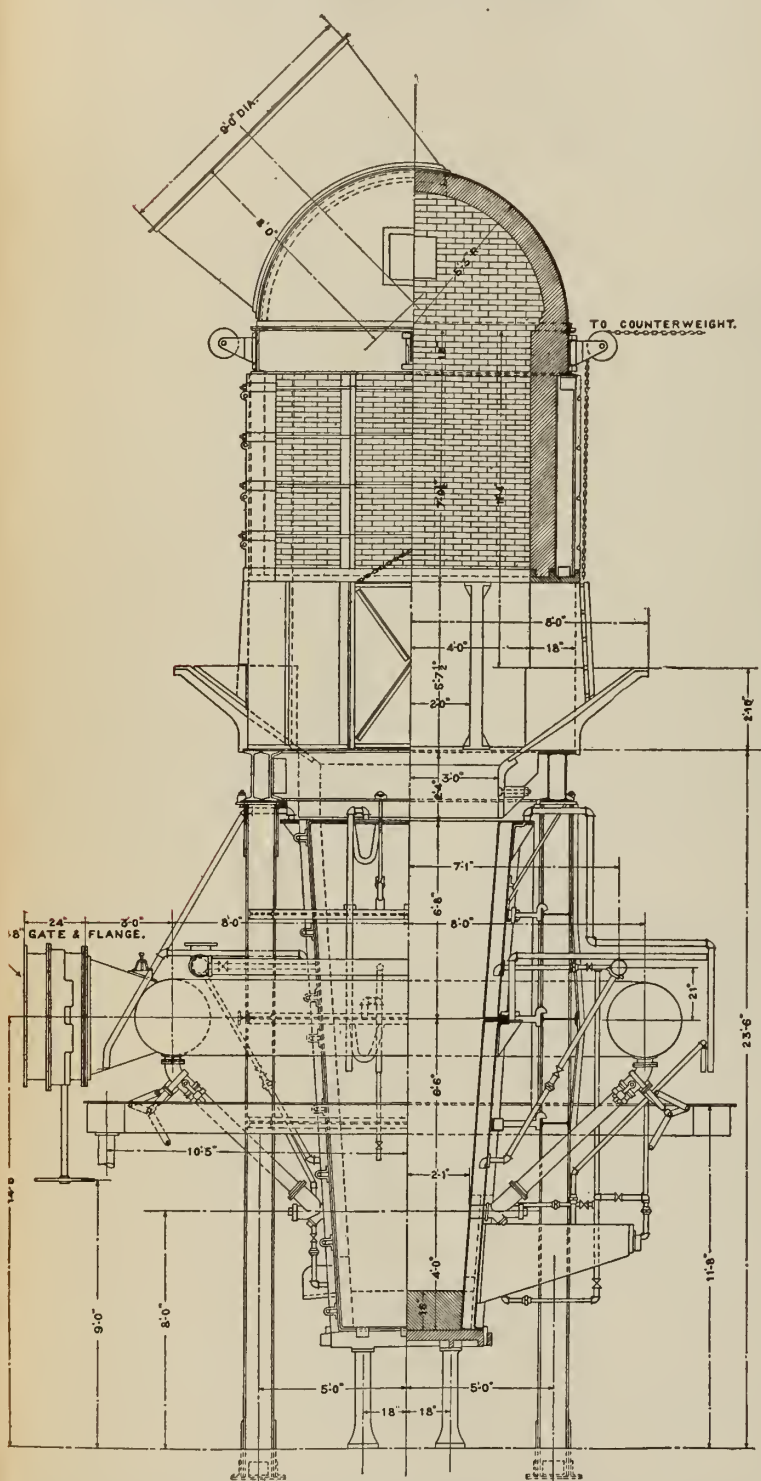
**Copper Blast Furnace, Anyox plant, Granby Consolidated Mining and Smelting Co. Vertical longitudinal section.**

The machine shop is 27 ft. by 97 ft. It contains a planer, 30 in. by 32 in., with a 9 ft. table; one lathe 16 in. swing, 5 ft. centres; one lathe 32 in. swing, 12 ft. centres; one McCabe double spindle lathe, 26 in. and 48 in. swing, 12 ft. centres; one milling machine capable of milling 14 in. gears; one Bickford radial drill press 5 ft. swing arm, 24 speeds, Universal table; one No. 4 drill press; Curtis and Curtis pipe cutter cuts pipe

one set 5 ft. rolls; one set pneumatic clamps. The blacksmith shop, 28 ft. by 45 ft., contains one 1,100 lb. Bement-Niles steam hammer and all the necessary tools and forges. The roundhouse, 28 ft. by 36 ft., holds two engines at a time and has repair pits under each track. The electrician's workshop, 15 ft. by 24 ft., has a lathe for rewinding armatures, and other necessary equipment. There are also several storage houses includ-



ing an iron house, 50 ft. by 50 ft., and a jacket, pipe, and storeroom, 24 ft. by 120 ft. The warehouse stands isolated from the other buildings, its dimensions are 50 ft. by 70 ft. The carpenter shop, 34 ft. by 47 ft., is equipped with planers, stickers, handsaw, a wood lathe, and other necessary machinery and tools.



Copper Blast Furnace, Anyox plant, Granby Consolidated Mining and Smelting Co. Vertical transverse section.

**Ore and Coke.**—As already indicated, the chief source of the ores treated at this smelter is the Phoenix camp of the Boundary district, 24 miles from the smelter. A small quantity of siliceous custom ores is also purchased. Much of this comes from the Snowstorm mine in Washington. Coke is received from Fernie and Michel in the Crowsnest Pass coal-fields.

It comes partly in box cars having four long slots in the bottom, for dumping; most of the supply comes in 40-ton steel coke-racks which dump outwards. Clay for use in lining converters is received from Hendrix Cut, Washington. It is dumped into the end bins near the converters. The clay bins have a capacity of 500 tons, and the discharge at the end.

**Blower Plant.**—Blower engine room No. 1, north of the furnace building, is equipped with the following Connersville blowers: One No. 10 30,000 cu. ft. of free air per minute; four No. 8 52,000 cu. ft. of free air per minute; three No. 7, 37,500 cu. ft. of free air per minute.

In the main blower engine room, in the L there are four more No. 10 Connersville blowers, 30,000 cu. ft. capacity each. The total capacity of the blowing engines is 239,500 cu. ft. of free air per minute. All the blowers deliver to a common receiver, consisting of two 60 in. pipes at the back of the furnaces. Connection with the tuyeres at each furnace is made by bustle pipes. All blowers are belt driven from Westinghouse alternating current motors. The No. 10 blowers are each driven by two 150 h.p. Canadian Westinghouse, 580 r.p.m., motors, belt connected at each end, running the blower at 100 r.p.m. and supplying 300 cu. ft. of air per revolution. The No. 8 blowers are driven by one 100 h.p. motor for each blower, running the blower at 130 r.p.m. and delivering 100 cu. ft. of air per revolution. The No. 7 blowers are also driven by individual 100 h.p. motors running the blower at 155 r.p.m. and delivering 80 cu. ft. of air per revolution.

The building also contains one 12 in. by 18 in. Rand, Class E compressor, supplying air at 80 lbs. pressure for pneumatic tools in the shops. A brick and steel room within blower building No. 1 contains the 22,000 volt transformers and switchboards which are connected with the Cascade power plant for use in emergency. They include an air-cooled set of 1,000 h.p. and an oil-cooled set of 800 h.p. Blower engine building No. 2 contains the following equipment in addition to the four Connersville blowers located in the L:

One 36 in. by 36 in. Nordberg blowing engine, capacity 3,700 cu. ft. of free air per minute; one 34 in. by 34 in. by 36 in. Allis-Chalmers duplex engine supplying 6,000 cu. ft. per minute, when running 81 r.p.m.; one 40 in. by 40 in. by 42 in. Nordberg duplex engine, 10,000 cu. ft. per minute, giving a total capacity of 19,700 cu. ft. per minute. All are belt driven from Westinghouse alternating current motors, of 200, 300 and 500 h.p. each respectively. This plant is of ample capacity to operate all three converter stands simultaneously using air at 12 lbs. pressure.

Air for the tampers, when silica linings were used, was supplied at 80 lbs. pressure, by one 12 in. by 18 in. Rand Class E compressor. A motor generator set is installed to operate the cranes, tilt the converters, and run the charge system. The motor is a 200 h.p. alternating current motor, running at 850 r.p.m.; it is direct connected to two 85 k.w. generators, running at 750 r.p.m. and supplying current at 220 volts. An hydraulic triplex plunger pump, 6 in. by 10 in., driven by a Westinghouse 30 h.p. running at 850 r.p.m., supplying water at 250 lbs. pressure, is also located in this building. This plant is used for operating the slag casting machine and the wheel press in the shops when the high pressure line is in trouble.

**Copper Blast Furnaces.**—The plant is equipped with six furnaces, 44 in. by 260 in. having 4.5 in. tuyeres, 18 in. centres, and 12 in. bosh, and two furnaces 48 in. by 266½ in., 3.5 in. tuyeres, 8 in. centres, 12 in. bosh.



These furnaces are served by two 12 in. water mains and two 60 in. blast mains, directly behind and running the entire length of the building in front of the furnaces. There are two 10-ton Morgan Engineering Co.'s cranes installed, one being kept in reserve. Each crane has three direct current motors, and is used for handling all heavy material and to deliver matte to the converters.

The furnaces are numbered in order beginning at the north end. Furnaces Nos. 1 and 8 are three jackets high, the others two; furnaces Nos. 5 and 6 have 60 small tuyeres, while the others have 30 tuyeres of the larger size. On furnaces 5 and 6 the upper jackets are placed vertical, while the lower jackets, which are straight, are set at an angle from the vertical; the upper jackets on the other furnaces are also vertical, but the lower jackets are boshed.

The portions of these furnaces above the water-jackets are built of brick, ordinary red brick being used outside, and firebrick inside for those parts which are exposed to greater heat. The brickwork is bound with 56 lb. rails, I beams and buckstays are used to hold the jackets in position.

The jackets are of riveted steel, fire plates 7/16 in., air plates 3/8 in. The circulating water enters the upper jackets and flows thence to the lower jackets; all the jackets have deflectors to throw the cold water to the bottom. About 2,000 gallons per minute are required by the eight furnaces, which is equivalent to 3 gallons per minute per sq. ft. of hearth area. Water enters at a temperature of 35 deg. to 50 deg. F. and issues at 140 deg. F.

Each furnace is provided with a water cooled trap spout; the trap is 5 in. to 5.5 in.

There are two settlers for each furnace. The one next the furnace, which receives the continuous flow of matte and slag, is rectangular in section, 72 in. by 90 in. with rounded corners, and 36 in. deep. It is surrounded by a continuous 2 in. water-jacket, the inner plate 3/8 in., the outer 1/4 in. steel. The removable bed plate is of cast-iron 2 in. in thickness. To prepare a settler for use a course of firebrick is laid in the bottom, then both bottom and sides are lined with the quartz-clay cement material used for lining the converters. A lining of one course of red brick and one course of firebrick is also used.

The life of a settler depends upon the rate at which it fills with metallies; when the bottom becomes high enough to materially decrease the capacity of a settler it is replaced by one newly lined. The metallies are then removed from the former and broken up with a heavy ball weight.

The second settler is similar to the first, but smaller, 48 in. x 60 in. and receives the slag overflow from the latter. The slag overflow from this settler discharges into granulating water and is washed to the draining bins, whence it passes to the slag elevator. A third small settler is sometimes introduced between this second settler and the granulating stream. Recently some experiments have been made in introducing as many as six settlers in a string. The additional saving has barely paid the cost of the operations.

**Converter Plant.**—The converter equipment consists of 3 converter stands, electrically operated by 25 h.p. motors, and 10 shells, 84 in. by 126 in., by the Power and Mining Machinery Company. There are also trucks carrying moulds for metallic copper, and a slag-casting machine and conveyer.

During the summer of 1912 experiments were made

in lining the acid shells with a basic lining and the relining plant was not in use. The relining equipment, which was still in place, included three Allis-Chalmers self discharge mortar mills, two 7 ft. pans, and one 6.5 ft. pan. The shells were tamped with air rammers. All machinery was driven by a 75 h.p. motor. When acid lined converters were used the practice was to line with chrome brick placing some magnesite brick around the tuyeres; inside this was placed a 2 ft. layer of siliceous ore cemented with clay and well tamped; silica brick was used on the caps.

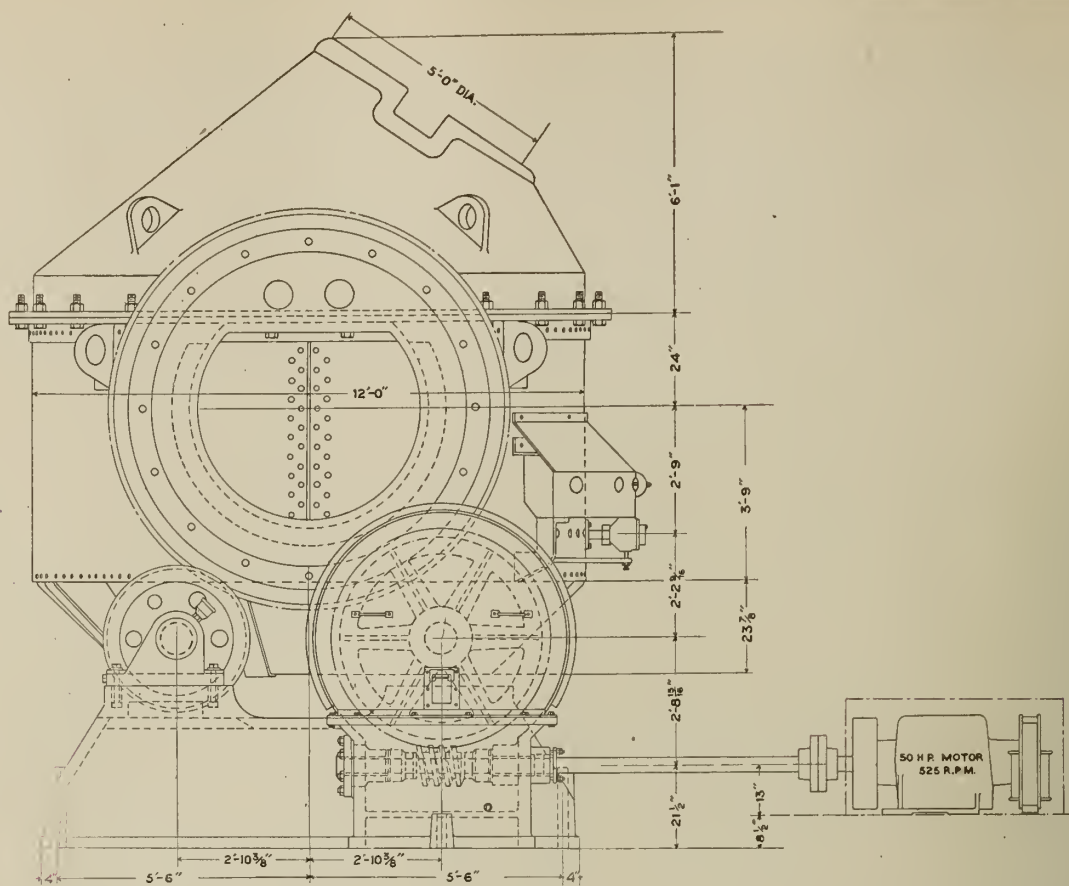
The converter building is supplied with a 40 ton four motor Morgan Engineering Co. crane, 42 ft. span, which runs the entire length of the building, and is used for shifting converter shells, handling matte, charging converters, etc.

**Briquetting Plant.**—The greater part of the flue dust is collected in the steel dust chamber, whence it is discharged through 9 in. openings into a trough kept clean by a rope drag conveyer. The attendance of one man for part of a day is needed to control the flow of dust from the hoppers; all other movements are automatic. Dust from the brick chambers at either end of the flue is drawn out by hand through the side openings into barrows, and conveyed to the briquetting mill. At this mill all the dust is dumped into a receiving bin from which it is drawn by an automatic feeder to a mixer. It is moistened thoroughly, no binder being necessary, and then passes to a No. 2 White briquetting machine which has a capacity of about 50 tons per 24 hours, or 4,000 briquets per hour. The machine delivers the briquets to a belt conveyer which transfers them to charge cars; they are recharged without drying.

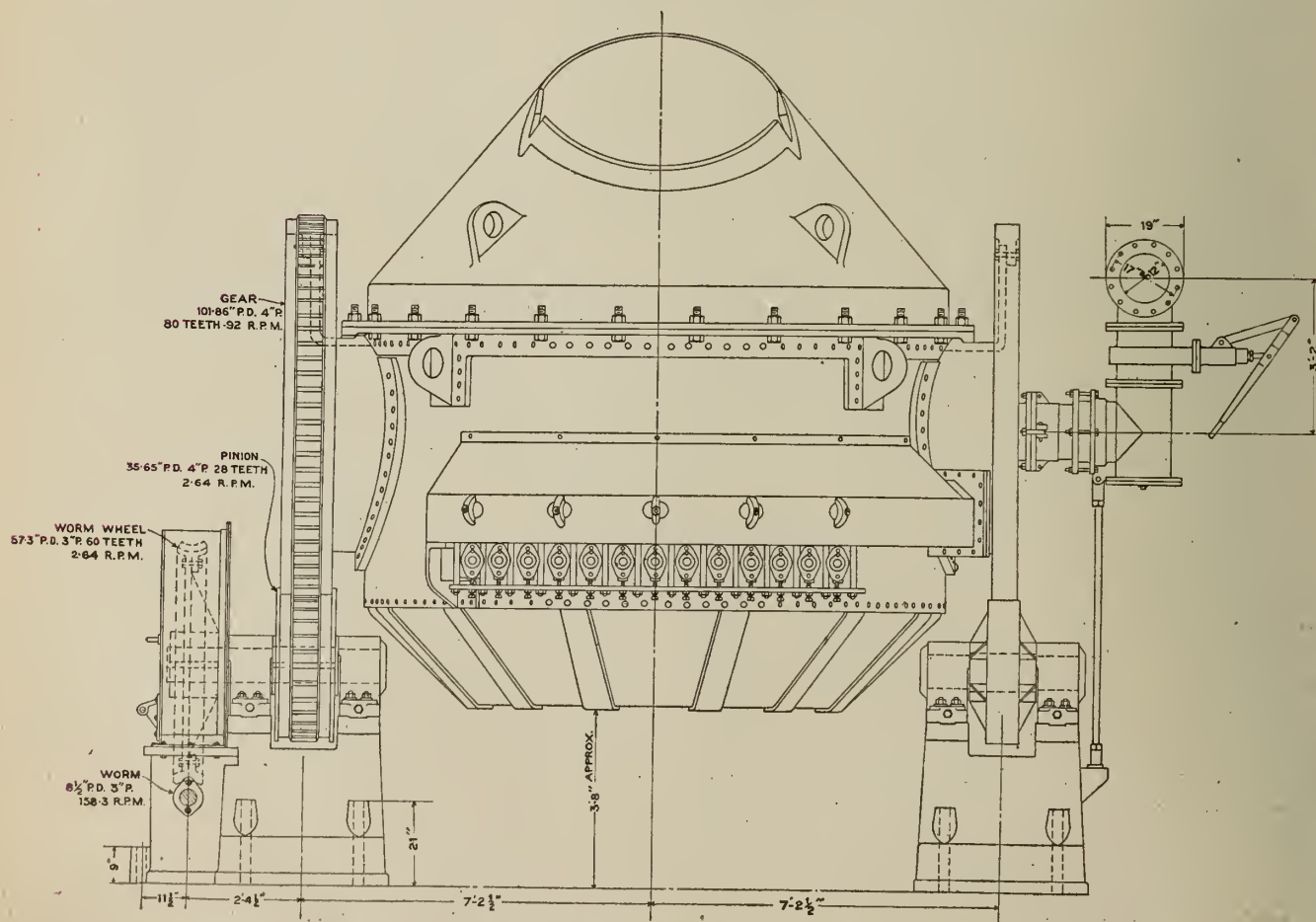
**Smelting Practice.**—Coke and ore are charged separately into the furnaces. A train of three cars is run under the bins by the electric locomotive, and receives a charge of 1 1/4 tons of coke; after weighing this is charged into the furnaces by backing the train through the end door of the furnace and dumping the cars when the entire train is within the furnace. The train then returns to the bins for the ore charge; the cars are filled to their capacity, 10 tons per train, and are then weighed, run into the furnace, and dumped as before. The former custom was to load the coke into the bottom of the car with the ore on top and to dump the two simultaneously; practice has shown, however, that a more even distribution of both constituents of the charge is obtained when they are charged separately. Ore is charged at intervals of 20 to 30 minutes.

As already noted Phoenix ores are of very uniform composition, carrying 1.2 to 1.6 per cent. of copper. An average analysis would show approximately the following composition, SiO<sub>2</sub>, 35%; FeO, 13%; CaO, 17%; Al<sub>2</sub>O<sub>3</sub>, 8%; MgO, 3%. The iron is present as a silicate chiefly, uncombined with oxides and sulphides, while nearly all the lime and magnesia occur as carbonates. Chalcopyrite is the copper-bearing mineral, and it also carries gold and silver. About 65% of the sulphur in the ore is burned off—the concentration being approximately 32.1. A typical slag would show the following analysis: SiO<sub>2</sub>, 45%; FeO, 15%; CaO, 22%; MgO, 3.8%; Al<sub>2</sub>O<sub>3</sub>, 7%; copper 0.22%. The matte will average about 35% copper, 10 to 15 ounces of silver, and 1.6 to 2.6 ounces of gold per ton.

There is a constant flow of matte and slag from each furnace to the settlers; these being arranged either two or three in a string, one large and one or two small. The furnace slag from the last settler is discharged



Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co. Vertical transverse section.



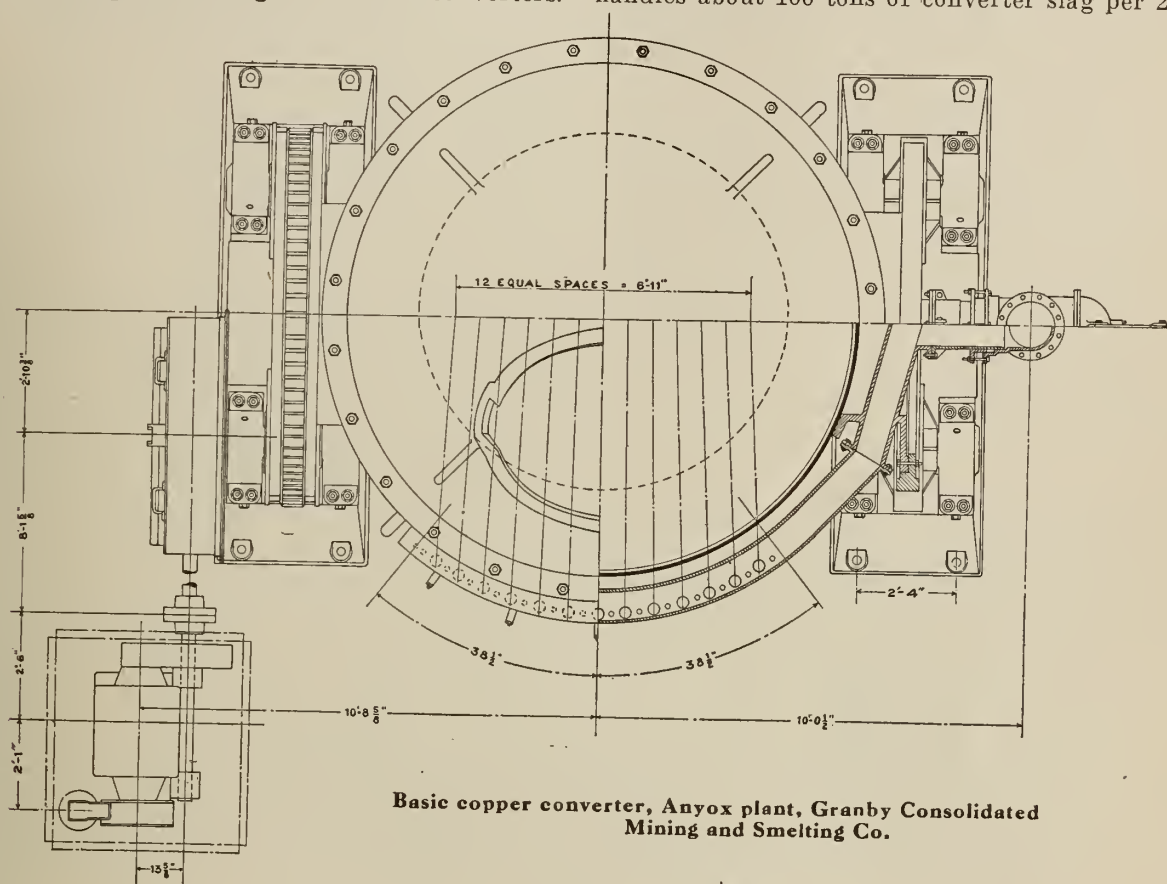
Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co. Front elevation.



into granulating water, which sweeps it down into the drainage bins, whence it passes to a belt leading to the distributor. The matte is tapped at intervals into 5-ton pots in which it is conveyed to the converter building.

Matte pots are received by the 40-ton crane in the converter building and charged into the converters.

Slag is dumped into a bin from which the slag can be drawn into steel railway cars. The converter slag is transferred to the charging bins and thence to the blast furnaces as part of the charge. This conveyor is driven by a 5 h.p. motor at a speed of 20 ft. per minute. It handles about 100 tons of converter slag per 24 hours.

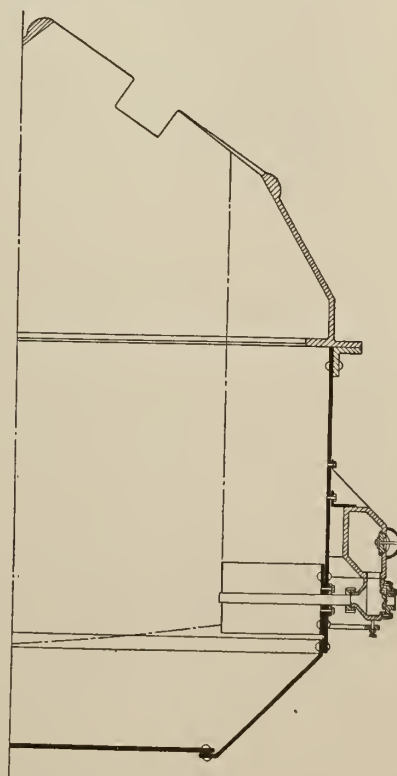


Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co.

There is no definite quantity of matte per charge as the converters are seldom run to their capacity. The blast is used at about 12 pounds per sq. in. Converter copper carries 99.5 to 99.6 per cent. copper, 25 to 37 ounces of silver, 4 to 6.5 ounces of gold per ton. The impurities shown by an average analysis were as follows: Fe, 0.17%; S, 0.11%; As, 0.014%; Sb, 0.008%; Se and Fe, 0.012%; Ni and Co, 0.123%; Zn, 0.004%; Pb and Bi, none.

Converter copper is run into moulds carried on a truck. These trucks are 16 ft. in length and run on 44 in. gauge tracks, and there are 3 trucks to a stand; each truck carries 8 moulds 33 in. by 24 in. outside dimensions, forming a continuous row from car to car. When a converter is ready to pour, a train of these cars is drawn underneath this converter by a wire rope operated by a motor driven drum. The converter is turned over and the pouring begins when the last mould is under the lip; the copper is poured in a continuous stream, the train being pulled forward as the moulds are filled. A bar of cast copper from one of these moulds weighs about 220 lbs. The bars are cobbled, removed, trimmed, and loaded directly into cars for shipment.

The converter slag is poured into pots holding about 3 tons. These are picked up by the crane and set in a tilting frame above the slag conveyer. The frame is then tilted by hydraulic power and the slag pours into the moulds of a conveyer that carries it up an inclined plane under water sprays, which cool it. The conveyer



Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co.  
Section on a trolley.

This slag contains up to 40 per cent.  $\text{SiO}_2$ , and varying amounts of copper; the balance is principally iron oxide.

**Costs.**—Steady improvement has been made in cost of treatment. In 1902 cost was 4.08 per ton, in 1907 3.28, and in 1912 2.47. Figures showing production and recovery for 1913-14 will be found in the report printed elsewhere in this issue.

### Anyox Plant, Anyox, B.C.

This plant was erected to smelt the ores from the Hidden Creek mines near Granby bay, on Observatory inlet, about 110 miles northeast of Prince Rupert. The plant consists of three rectangular water-jacketed furnaces, 50 in. by 360 in., and three basic converters, Great Falls type, each 12 ft. in diameter. The accompanying plates and figures have been prepared from material supplied through the courtesy of the Traylor Engineering and Manufacturing Co., who built the furnaces and converters. The plates represent the appearance of the furnaces as set up at the works before shipment.

**Blast Furnaces.**—Each furnace measures 50 in. by 360 in. at the tuyeres. The height from tapping floor to charging floor is 26 ft. 4 in.; the sole plates stand 4 ft. above the tapping floor, and the top of the upper tier of jackets is 17 ft. 2 in. above the sole plates, the lower jackets being 10 ft. 6 in. in height, and the upper jackets 6 ft. 8 in. There are six jackets, each 54 in. in width, and one tap hole jacket, 36 in. in width, on each side of each furnace, the larger jackets being provided with 5 tuyere openings, and the narrow jacket with three. The tuyere openings are of an improved form, the steel thimble being fused to the fire sheet, and forming a smooth joint. The outer end of the thimble projects through the air sheet, and is beaded in place. The upper tier consists of 6 jackets on each side, each 60 in. in width.

The sole plates are of iron cast around coiled pipe, through which cooling water can be circulated. They are carried on 24 pedestals, each 3 ft. 8 in. in height, the sole plate being 4 in. thick, with 2 in. flanges.

The jackets are connected together by bolts and brackets in the usual manner. To prevent bulging, a jacket binder frame is built around the furnace between the corner columns. Cast steel spacing rods extend from this frame to each jacket, fitting into sockets that are riveted to the jacket. These binder rods fit over the I beams with a hook connection, and wedges driven in behind the binder frame make a very rigid fastening. This type of construction makes it possible to easily remove or replace a jacket without disturbing the binder frames. The simple removal of the wedges releases the binders on any individual jacket without disturbing the others.

Each blowpipe leading from the bustle pipe to a tuyere opening is fitted with a ball and socket joint, which is placed below the blast gate. This allows the blow-pipe, together with the tuyere casting, to be swung down clear of the furnace when it is necessary to remove or replace a jacket. The tuyere casting is released from the jacket by removing two hook bolts.

The upper tier of jackets is supported from the mantle frame in such a way that the lower jackets may be removed without disturbing them. The breast jackets are constructed of iron cast around wrought iron pipes for carrying the cooling water. The furnaces are arranged to be charged from either side, and the charging doors are operated by counterweights.

The furnaces are designed in such a way that the mantle frames are connected together, forming one continuous mantle for the three furnaces. The sole plates extend beyond the end jackets so that the furnaces may be extended at any time. The three furnaces are placed with two 15 ft. spaces between the middle and the end furnaces. Eventually this space may be filled, making one furnace 120 ft. in length, in place of three, each 30 ft. in length.

The hoods are built of brick, with straight sides, and semi-circular top, stayed with structural steel and tie rods. The crown stands 16 ft. 7 in. above the charging floor, the arched top being built with a 5 ft. 3 in. radius. The steel downcomer, 9 ft. in diameter, leaves the middle of a long side of the furnace at an angle of 45 deg.

**Converters.**—The converter equipment includes three of the Great Falls type of converters, each 12 ft. in diameter and 17 ft. 7 in. in height. They are each provided with 13 tuyeres, 2 in. in diameter, in place of the 25 to 30, 1.5 in. in diameter, used on the standard Pierce-Smith converter. The tuyeres are placed with their axes at right angles to the axis of the shell so that they blow directly into the converter. Each tuyere pipe projects into the converter, and is connected with the tuyere casting by a special coupling so designed that it may be screwed off the back of the tuyere and the casting removed without interfering with the tuyere pipes. The tuyere pipes have individual tuyeres, with the Shelby improved tuyere valve; a projection in the middle of the valve comes into contact with the point of the barring rod; this projection is made high enough to enable the bar to clear the seat of the valve.

The converters are each turned by 50 h.p. electric motors through worm gears. The equipment is designed to operate the converter through about 235 deg., or nine-tenths of a revolution in one minute.

### DOME.

The Dome Mines, Porcupine, in September, made the largest gold production recorded since the mill began to take low grade ore. The amount of gold produced, \$99,301.80, has been exceeded in only four months during the last fifteen. The average value of the tonnage milled was \$4.52.

During September the mill treated 21,940 tons, or almost 2,000 tons more than in August, the largest month to that date.

The record of the Dome for the past fifteen months is as follows:

	Tons.	Value gold produced.	Value per ton.
1913.	milled.		
July. . . . .	11,150	\$75,958	\$6.81
August. . . . .	10,720	67,660	6.31
September. . . . .	10,790	70,135	6.50
October . . . . .	12,370	118,000	9.53
November. . . . .	13,820	121,150	8.76
December. . . . .	13,470	106,904	7.93
1914.			
January. . . . .	13,900	111,500	8.02
February. . . . .	12,010	69,000	5.74
March. . . . .	14,979	87,657	5.85
April. . . . .	14,770	97,454	6.59
May. . . . .	16,180	62,109	3.83
June. . . . .	18,250	83,421	4.51
July. . . . .	19,780	82,984	4.19
August. . . . .	20,170	90,893	4.50
September. . . . .	21,940	99,302	4.52



## ANNUAL REPORT, GRANBY CONSOLIDATED MINING, SMELTING AND POWER COMPANY

The report for the year ending June 30, 1914, of the Granby Consolidated, Mining, Smelting and Power Co. has been issued. General Manager Sylvester says:

"At Phoenix the acquisition of the Snowshoe mine, adjoining the Gold Drop mine, added 140,000 tons to the total ore of the mines there, while the diamond drilling and other development work has further increased this by 142,684 tons, the total ore to date showing as 15,132,368 tons, from which has been shipped 10,440,837 tons, the balance of the developed ore being 4,691,531 tons.

"The development work for the year ending June 30, 1914, at Phoenix has been more extensive than during any previous year, and though the total tonnage increase of ore has not been considerable, a part of this increased tonnage is of higher grade than the average

has continued the good showing of previous years' work; the diamond drill work and extension of drifts and raises has materially increased the tonnage of a grade of 2.2 per cent. copper (as well as the amount of ore of a lower grade), the present estimates indicating 9,563,500 tons, or 1,803,950 tons more than the report of the last fiscal year showed. In addition to this there is estimated a tonnage of 8,589,500, showing an average of 0.6 per cent. copper. While the average copper content of this ore is taken at 0.6 per cent., there is much of it having 1 per cent. or 1.25 per cent. copper, which may be mined with the higher grade ore and taken care of by the furnaces. It may develop as the operation of the furnaces progresses, that the addition of reverberatory furnaces will be desirable to properly take care of the fines from the ore and the flue dust, and following such



Snowshoe and Gold Drop Mines, Phoenix, B.C.

ore remaining in the mine. The operating cost of 80 cents per ton of ore shipped, which includes all costs of breaking, handling, timbering, development work and general expense, compares very favorably with previous years.

The exploration work and investigation of near-by mine properties, which has been carried on from the Phoenix office, and confined mostly to the district south of this point and east of the Republic camp of the State of Washington, has so far shown only negative results.

"The Grand Forks smelter treated 1,225,745 tons of ore during the year and produced therefrom: Copper, 21,181,000 lb.; silver, 407,506 oz.; gold, 43,232 oz, at a cost for smelting and converting of \$1.28 per ton, which cost is as low as has ever been obtained at this plant.

Regarding the Hidden Creek properties, Mr. Sylvester says:

"The work of opening up the Hidden Creek mines and developing the orebodies during the last three years has been conducted in a thorough, systematic and efficient manner, making these orebodies easily accessible for future mining operations in producing ore for the smelter. The further development of the mines this year

a provision, the concentration of low grade, high silica ores to furnish an additional product for the reverberatory plant.

"The construction of the smelter plant, with the necessary appurtenances, such as wharf, and town buildings comprising a large retail store and warehouse, office, hotel, hospital, dwellings for the families, quarters and mess for single men, railroads connecting wharf, mine and smelter plant, power house, pipe line and dam, all of which was practically started in the spring of 1913, though much of the logging and clearing had been accomplished prior to that time, was sufficiently completed by the middle of March, this year, to warrant blowing-in one of the furnaces, and beginning the metallurgical operations. This was done at that time, and the efforts of solving the problems of handling and treating most economically, new and untried ores, though slow of solution, requiring as they do experimenting with and changing of ore charge, amount of coke used, quantity and pressure of air, are meeting with success. Some of the lesser difficulties, such as breaking in and training green men to make up the necessary crews for three shifts, and the mechanical



troubles incident to starting a new plant, have been satisfactorily overcome, and much progress has been made with the purely metallurgical perplexities.

"During the year many properties located on or near the coast and tributary to the Anyox smelter, have been examined. Three of these, the Midas mine, near Valdez, the Mamie mine, at Hadley, and the Dean mine, on the west side of Kasaan peninsula, Prince of Wales island, Alaska, have been purchased, and an option has been taken on the It mine, near the Dean. Working options were also taken on some old mines at Van Anda, Texada island, north of the city of Vancouver.

"Many other properties have been examined by our men in this general district, with the result that a few of them will warrant our further interest and investigation; the balance have very little merit and are not likely to prove of value in the future. Prior to the purchase of the Midas mine, considerable work had been done, and ore developed in sufficient quantities and values to warrant not only its purchase, but the construction of wharf and shipping bunkers at Valdez bay, with an aerial tram line to the mine, mine bunk house buildings, power equipment and preparation for putting the mine on a shipping basis. When this work was started, about May first of this year, it was expected shipments would be made by October first, and the progress which has been made in constructing the several parts of the surface improvements, and the work in the mine has indicated that this expectation would have been met had it not recently been deemed desirable to curtail the company's operations at this point.

"The Mamie mine at Hadley, Prince of Wales island, was purchased after thorough examination. The subsequent preliminary work incident to clearing the mine and starting development work, permitting further examination and sampling, has shown sufficient ore of a grade of at least 2.25 per cent., to more than meet the purchase price and expense of putting the property on a shipping basis. This property was partially equipped with a boiler and compressor, with an aerial bucket tram from the mine bunkers to the old bunkers at the smelter at the beach. To ship this ore to the Anyox smelter it was necessary to construct a small shipping wharf in the Bay in front of Hadley, known as the Lyman Anchorage, and to extend the tram line to a receiving bin on the wharf, put the power plant in an operating condition, pump out the mine and otherwise prepare it for working. This work was well along, and it is probable shipments, which may be made at the rate of 8,000 to 10,000 tons per month, could have been started in October, had not work been discontinued for the same reasons which influenced this course at Valdez. The preliminary work in connection with shipping from the It and Dean properties, which adjoin one another, was well in hand. It is not likely they will ever be very large producers, probably about 1,000 to 1,200 tons per month. All three of these properties, as well as the Midas mine, may be put upon a shipping basis in a short time, whenever the general market conditions for the disposal of copper will warrant it.

"The general result of the company's campaign for new sources of ore tributary to the Anyox smelter may be stated: Examinations have been made of approximately forty-five properties, from which eight were selected for further investigation or work under option to purchase or mine the ore on a royalty basis. Of these, three have been found unsuited to our requirements, three have been purchased, while two are still under option. Of these latter, four have sufficient potential value to more than compensate for the cost of

the work done on the former three, and one considerable property under option in Maple bay, upon which very little work has been done so far, remains to be considered at a later date."

### Mineral Bearing Ores Treated.

Following is a summary of the year's business:

Phoenix ores smelted .....	1,201,955 dry tons
Anyox ores smelted .....	63,105 dry tons
Foreign ores smelted .....	23,940 dry tons

### Produced.

23,320,097 lb. of copper fine, sold at average price of .....	\$ 0.1458
435,275 oz. of silver fine, sold at average price of .....	.5774
43,882 oz. of gold fine, sold at average price of .....	20.00

The total amount realized equals .....\$4,504,765.91

### Costs.

Working expenses at mines and smelters, freight, refining, selling and general expenses .....	\$3,627,924.26
Foreign ore purchased ...	254,770.30
Cost per ton, including all expenses, \$2.73.	\$3,882,694.56
Cost per lb. of copper after deducting value of gold and silver, 11.5c.	

### Profit and surplus.

Net profit for year ending June 30th, 1914 .....	\$ 622,071.35
Less—	
Dividends paid during year	\$899,900.54
Interest and special taxes paid .....	182,519.63
Surplus decrease for year..	460,348.82
Surplus carried over from last year .....	3,199,270.73
Total surplus at credit June 30th, 1914 .....	\$2,738,921.91
There has been expended during the year for developing and equipping Anyox and other properties. ....	\$3,002,691.46

### ASSETS AND LIABILITIES.

June 30, 1914.

#### Assets.

1. Cost of mineral lands .....	\$14,461,873.08
2. Cost of lands, real estate, machinery buildings, dwellings and equipment Grand Forks and Phoenix, less depreciation allowed .....	1,811,280.76
3. Cost of lands, real estate, machinery, buildings, dwellings, railroads, sea-going launches and vessels, mine smelter equipment at Anyox, B.C..	2,888,737.02
4. Cost of mine purchase—now under development. ....	468,135.31
5. Stocks and bonds .....	514,808.92
6. Fuel and store supplies .....	525,096.60
7. Cash and copper .....	1,375,793.80

\$22,045,725.49



## Liabilities.

8. Capital stock—issued shares 149,985.15 at \$100 .....	\$14,998,515.00
9. Series "A" convertible first mortgage, six per cent. gold bonds, due May 1st, 1912 .....	1,440,000.00
Series "B" non-convertible first mortgage, six per cent. gold bonds, subject to agreement for re-pur- chase May 8th, 1915, with inter- est adjusted to 5 per cent. ....	850,000.00
10. Loans secured by copper in transit..	536,684.34
11. Loans unsecured .....	960,000.00
12. Accounts payable .....	519,555.31
13. Dividends held for liquidation .....	1,057.25
14. Surplus. . . . .	2,739,913.59
	<hr/>
	\$22,045,725.49

At present there is "in sight" in the various proper-  
ties the following quantities of ore: Phoenix, 4,691,531  
tons; Anyox, 18,153,000 tons; Midas, 116,344 tons;

"We are equipped and prepared to ship 2,000 tons of  
average mine run daily. Supporting this equipment,  
with a small daily output will, of necessity, increase  
mining costs. Also, any selective mining we may do  
will have a tendency to place mining costs above our  
former estimates."

At Midas mine there has been developed 116,344 tons  
of ore. This will run: Copper, 4 per cent.; gold, 0.065  
oz.; silver, 0.46 oz.

This ore will be mined and delivered on the boat for  
approximately \$2.00 per ton. A lower tunnel has been  
run and has encountered the ore, which holds its width  
and value.

At Mamie mine the ore (135,200 tons) will average  
2.25 per cent. copper, and from 25 to 50 cents gold and  
silver. The ore has a value also as a flux. Undoubtedly  
a small amount of development work will increase the  
tonnage in sight to a great extent.

At It—Dean mines so little work has been  
done that it is not possible to deal accurately with ton-  
nage and values. At least 5,000 tons of ore will run



Granby's Gloryhole, Phoenix, B.C.

Mamie, 135,200 tons; It—Dean, 5,000 tons. Total, 23,-  
101,075 tons.

During the past year the company completed the fol-  
lowing development work upon shipping properties:  
Drifts and raises, etc., 19,046 ft.; diamond drilling, 25,-  
743 ft.

At Phoenix the company can recover 17 lb. copper per  
ton of ore; 0.033 oz. gold per ton of ore; 0.2 oz. silver  
per ton of ore. The cost of mining is approximately 80  
cents per ton.

At Anyox the company may mine 18,153,000 tons of  
ore running 1.4 per cent. copper, or 9,563,000 tons run-  
ning 2.2 per cent. copper. The gold and silver values  
will amount to about 30 cents per ton. The cost will be  
approximately \$1.00 per ton when mining from 1,500 to  
2,000 tons per day of average mine run. This cost will  
decrease as the stopes are opened and enlarged.

Mr. O. B. Smith, superintendent of mines, says:

"We have done sufficient stoping to prove our former  
reports conservative. The ground drills well and is go-  
ing to stand without timber. Up to date (Sept. 1st)  
the average ore shipped has been higher in copper and  
lower in silica and alumina than the estimates we have  
made.

from \$15.00 to \$20.00 per ton. The properties are fully  
equipped and mining costs should not be excessive.

At Van Anda, Texada island, work has been discon-  
tinued. It is highly improbable that the ore there can  
be made to pay unless it is mined in large quantities  
with the country rock (limestone) and considered as  
a flux.

At present the company is prepared to produce the  
following tonnage daily: Phoenix, 3,000 to 4,000 tons;  
Anyox, 2,000 tons; Midas, 100 tons; Mamie, 300 tons;  
It—Dean, 30 tons. Total, 5,430 tons.

## Grand Forks and Anyox Smelters.

Mr. W. A. Williams, smelter superintendent, says:  
"The Grand Forks smelter has done very good work  
from an operating standpoint. There has been a very  
high average of furnaces in blast, with good tonnages  
smelted; recovery good. Our losses were the same as  
previous year. Silica was higher in slags. Costs were  
a trifle lower than any former year. These results  
have only been attained by the careful attention of our  
entire crew of men.

"At Anyox we 'blew-in' the first furnace in March.  
With the new crew of men to be broken in to this kind



of ore and smelting, and the organization of the other departments, we have and are just getting settled.

"We have had some mechanical troubles. The settlers were hard to hold and to prevent break-outs; the converter worm-drive also gave us trouble. At the present time we have most of these troubles eliminated. Mechanically the plant is all right and operates as we intended.

"We have metallurgical problems to work out. The ore seems to contain a lot of 'fines,' especially No. 1 ore, and it looks as if it would be better to screen this, using the coarse on blast furnaces, and either nodulizing the 'fines' and flue dust, or smelting them in reverberatory furnaces, and using the matte on the blast.

"The railroad department is in good working order; both cars and locomotives acting well and handling tonnage satisfactorily. With our docks and unloading equipment we are able to handle and unload any ship or barge quickly and easily. We have all the cottages erected for our present requirements, and the water and lighting systems are completed. Everything in the town department is in excellent shape. I wish to give credit to Mr. Bone and the heads of departments for their zeal and energy and the close attention they have given to

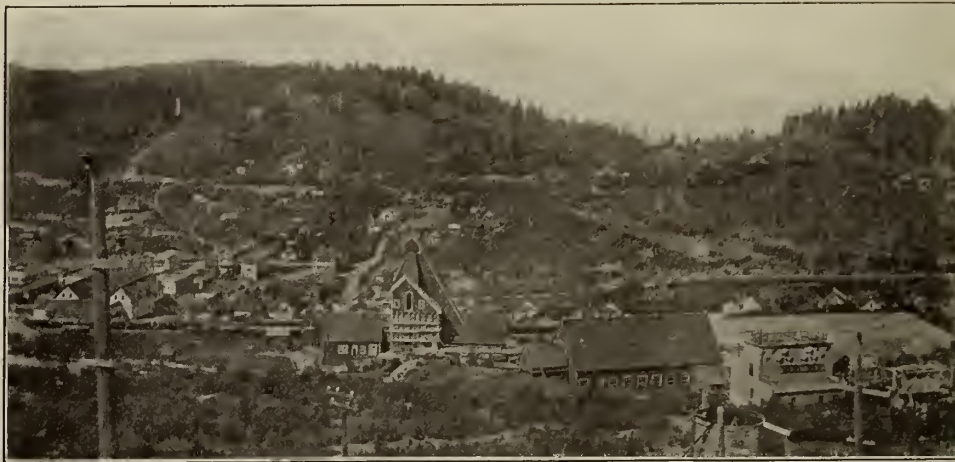
"Diamond drilling for the year amounted to 19,670½ ft. and the total to date is now 95,812 ft. The Snowshoe mine was acquired during the year.

"The average cost per ton, on cars, including all development was 80.4 cents. This means an increase of five cents per ton over last year's costs. This increase is in part due to extra development and in part to extra work necessary to mine and handle ore from outlying and thinner orebodies. In addition to this more waste was handled than ever before, the tonnage being 176,027.

"New ore developed during the year amounted to 282,684 tons. The present condition of the ore reserves is therefore as follows:

	Gold Drop.	Ironsides.	Total.
Ore developed . . . .	1,401,000	13,731,368	15,131,368
Mine has produced and shipped . . . .	1,268,737	9,172,100	10,440,837
Remaining ore . . . .	132,263	4,559,268	4,691,531

"Returns from the smelter show a recovery of 16.89 lb. of copper per ton of ore. We consider a recovery of 17 lb. can be maintained."



Victoria Shaft, Granby Mine, Phoenix, B.C.

organization and their work. We are gathering a good crew of men and every one seems to take interest in the plant generally."

#### Phoenix Mines.

Superintendent C. M. Campbell reports: "Shipments from Phoenix mines amounted to 1,202,555 tons. The following table shows an analysis of the ore shipments to date:

	Above No. 3	Victoria	Tunnel	Shaft.	Gold Drop.	Totals.
Prior to July						
1st, 1913 . . . .	5,276,758	2,867,926	1,091,598			9,236,282
Year ending						
June 30, 1914	483,065	544,351	177,139			1,240,555
Total to date . . .	5,759,823	3,412,277	1,268,737			10,440,837

"This was the largest on record both in respect to underground work and diamond drilling. Totals for the different places and the totals to date are as follows:

	Sinking.	Raising.	Drifting.	Total.
Gold Drop . . . . .	—	2,260	2,700	4,960
Ironsides. . . . .	15	4,791	3,881	8,687
Total for year . . . . .	15	7,051	6,581	13,647
Total to date . . . . .	2,487	46,095	72,913	121,495

#### Hidden Creek Mine.

Superintendent H. J. C. MacDonald reports: "The work on the Hidden Creek mine for the first half of the preceding twelve months consisted of the development and equipment of the mine for production. This work was completed by the first of the year, and the mine was then in condition to mine and ship ore to the smelter. During the period elapsing until the smelter started operating, on the sixteenth of March, the development work was put into use, in order to correct defects and place everything in a smooth working condition. Upon the "blowing in" of the smelter the mining and shipping of regular daily lots of ore commenced and has been continued up to the present time.

"The mining development consisted of 3,794 ft. of raising and sinking with 1,525 ft. of drifting and cross-cutting; making a total footage of 5,319 ft. for the year. Nearly half of the footage was made on the 530 level, and this level still remains the most completely developed in the mine. The greater part of the work consisted in the driving of raises in preparation to the stopping of the ore.

"The 385 tunnel was driven ahead to intercept the No. 2 orebody on this level. The 130 ft. driven into the ore gave an assay return of 2.6 copper, the grade of the



ore appearing to be better at this depth than on the 530 level above. Starting near the end of the 385 tunnel a system of raises was driven leading to the surface of No. 2 orebody. Here open-cut mining has been started, and through these raises it is possible to handle a large portion of No. 2 ore without transferring on the upper levels. Three raises in the No. 1 orebody were driven and are now available for the transfer of ore from the 530 to the 385 level.

"On the 530 level some drifting was done in the north end of No. 1 orebody, and the 130 and 140 drifts were driven in the development of No. 3 orebody. With the exception of this the remainder of the driving was done in raises opening up the stopes above the level.

"Thirty holes, Nos. 136 to 166, were drilled, making a total footage of 6,072.5 ft. These holes were drilled in the six following groups for the exploration of certain orebodies or portions of orebodies.

"The mining having been done in areas already estimated in the ore reserves, practically all the additional tonnage gained during the year was through the diamond drilling. A considerable amount was added to No. 1 orebody, while our estimates show a slight decrease in the bulk of No. 2 orebody. Two entirely new orebodies, No. 3 and No. 4, were discovered and explored. They are of the same general type as No. 2 orebody and in the same mineralized area. The total ore developed in the two bodies is 1,407,500 tons, carrying 1.8 per cent. copper.

"Diamond drilling was discontinued in March, as holes can be placed to a greater advantage in the future when the mine openings are more numerous. We have now drilled 166 holes, making a total footage of 43,591 ft. The drilling of the known orebodies above the 385 level is now thorough enough for our purposes at the present time.

"The previous estimates have been based on vertical sections taken at irregular distances through the orebodies. The place of these sections was determined by the areas where the most development work had been done, and therefore where the value and character of the ore was best known. This year's estimate is upon vertical sections, which are taken at regular 100 ft. intervals throughout the length of the bodies. These sections will be retained as a basis for our ore estimates in future reports. A very close agreement in the value and the tonnage of the ore was obtained in the two estimates based on the old and new sections, so that no appreciable error has been introduced into our calculations.

"The ore reserves are now estimated at 9,563,000 tons of ore carrying 2.2 per cent. copper and about 30 cents in gold and silver. This ore which we call the "high grade," is surrounded by a large body of "low grade" ore, running 0.6 per cent. in copper, containing 8,589,500 tons. Taking the low and high grade together gives a total of 18,153,000 tons of 1.4 per cent. ore. While it will not be policy to mine all the low grade ore, the mining of a certain percentage along with the high grade will, from the nature of ore bodies, considerably reduce the cost of mining and smelting.

"There has been shipped from the mine 77,377 tons of 2.4 per cent. ore since the smelter was started. This has been principally No. 1 ore from the stopes above the 530 level. From the No. 2 orebody only 8,476 tons has been shipped. We have been mining a larger tonnage than could be used, and there is now 15,000 tons of broken ore in the mine.

"The year's work has consisted in brief, not taking into consideration the equipment of the mine, for pro-

duction, of 5,399 ft. of mine openings with 6,072.5 of diamond drilling. Through this work the orebodies have been explored to a greater extent than before, so that we are now able to make a conservative estimate of 9,563,000 tons of 2.2 per cent. copper ore, having a gold and silver content of about 30 cents a ton. This is a gain for the year of 1,803,950 tons of 2.2 per cent. ore. The shipments, while small, can be regarded as the best sample of the ore we have as yet obtained; and they have checked closely our previous estimates of the grade and analysis of the orebodies. The physical condition of the mine at the end of the year is the strongest that it has been since the starting of its development."

#### Midas Mine.

Mr. E. E. Campbell reports: "A large number of mining prospects were examined during the year. All are located in the Prince William Sound section that is directly tributary to the coast. No examination work was done in the interior, or Copper River district, as it would not be practicable for the Granby Co. to make any extensive investments in that country, under the present railroad service. Of the properties examined, the only one showing distinct merit is the 'Midas' mine, situated near Valdez, and the work on this constitutes the mining development in this district.

"Construction work started May 1st, 1914, and is proceeding so satisfactorily that at the present date it is apparent that a shipment of ore will be made before winter. The mining equipment being installed consists of a wharf, a three thousand ton bunker and a discharge belt at the beach; a five and one-half mile tramway extending from the beach bunkers to the mine; a three hundred ton bin with ore sorting belt and an air compressor at the mine. The power installation will consist of a two hundred horse power Diesel engine to drive the air compressor and supply whatever power may be required at the mine, a thirty horse power Foos engine at the beach to drive the aerial tramway and a fifteen horse power Fairbanks Morse distillate engine to drive the loading belt. At the mine a lower tunnel is being driven to serve as a main haulage tunnel, and it is intended to connect this with the next tunnel above by a raise which will serve as an ore pocket. Three cottages are in course of construction and a bunkhouse to accommodate forty men.

"The development work already done on the property on the date of purchase, October 15th, 1913, consisted of 2,000 ft. of drifting, raising and crosscutting, 1,500 ft. of which is on ore, and is made up of two tunnels, 500 ft. and 700 ft. respectively, and 300 ft. of raising. This work exposed a tonnage of ore estimated at 116,344 tons, containing an average value of: copper, 4 per cent.; silver, .46 oz.; gold, 0.065 oz.

"Under ordinary conditions, with the equipment that is being installed, this ore will be mined and delivered at the boat at a cost not to exceed \$2.00 per ton."

#### Mamie Mine.

Mr. N. W. Sweetser reports: "This property is situated on Prince of Wales island, at an elevation of 700 ft., 1 mile south of the town of Hadley, which is on the shore of Lyman anchorage. The property consists of eight claims; namely, the L. Kensington, Middlesex, Doolittle No. 2, Shamrock, Mamie No. 2, Doolittle No. 1, Mamie No. 1. Work was started by the Granby Co. on the Mamie mine, December 10th, 1913. The first four months were spent in repairing of equipment, and mining was not started until April 1st, 1914. Since April 1st about 250 ft. of drift work and 500 ft.



of raise work have been done. This work has been confined to the tunnel level, due to the fact that the lower levels were full of water, and there were no hoisting facilities.

"There is proven ore in the mine at present: On or above the tunnel level, 80,000 tons; on or above the 50 ft. level, 44,000 tons; on or above the 125 ft. level, 11,200 tons. Total, 135,200 tons. This ore will average  $2\frac{1}{4}$  per cent. copper.

"Boiler plant and compressor are ample for mining purposes. A number of places are ready to begin the stoping of ore. The dock for the delivery of ore from the tram should be completed by the 1st of October, and delivery of ore can be started immediately. Mining methods will be the same as those pursued at Phoenix.

"Work is being pushed upon the two lower levels. There is no question that the tonnage will be greatly augmented upon these levels. The crosscut recently driven upon the 50 ft. level showed 50 ft. of ore. On the lowest level the old company crosscut 35 ft. of ore near the shaft, and drove long drifts which are apparently in the hanging wall and footwall of the orebody. Drifting has been started and this drift will determine the future possibilities of the mine."

#### The It and Dean Mines.

Mr. Sweetser reports: "These properties are situated on Prince of Wales island, on the southern side of Kasaan Peninsula, about 4 miles north-east of the Kasaan Post Office. They are situated about 3,000 ft. from tide water at an elevation of 400 ft.

"Work was started by the Granby Co. on the It and Dean properties, June 20th, 1914. The first ten days were spent in cleaning and overhauling the plant, and underground work was not started until July 1st.

"The group comprise the following: The It property, under bond to the company, consisting of five patented claims, namely, the Alarm, It, Fraction, Eagle's Nest and Mesabi. The Dean property owned by the company. During the month of July the following claims were staked for the company, namely, Mint No. 1, Mint No. 2, Mint No. 3, Morning, intermittent No. 1, Intermittent No. 2.

"The ore consists of chalcopyrite in a gangue of garnet, epidote and calcite. The ore averages forty cents a ton in gold to each per cent. of copper. There are five lenses of ore showing upon the properties, one upon the Dean and four upon the It group, two of which have been worked. The ore upon which most of the work has been done has been opened to a depth of 200 ft. by means of a tunnel and three levels below driven from a winze.

"The ore in the lower levels is more irregular and of lower grade than above, and has not yet been encountered in the long crosscut tunnel driven below, although ore of too low a grade to be commercial has been encountered. A surface tram to the Dean orebody is nearly completed and stoping of ore will be started early in September.

"The natural advantages, such as wood, water, ease of transportation are all in favor of the properties. The It power plant located at the beach is an economical plant capable of furnishing power for all purposes.

"The larger lens upon the It produced nearly \$150,000. This ore averaged eight per cent. copper and four dollars in gold. Insufficient work has been done upon any of the ore exposures to determine the available tonnage, and only an estimate can be given. The ore in sight at present might be safely put up 5,000 tons. This ore will average between \$15 and \$20 a ton. The whole group is a mineralized area and there is no question

that other lenses can be discovered by surface trenching."

#### The President's Report.

Wm. H. Nichols in presenting the report for the year ending June 30, 1914, said under date of Oct. 6.:

"Since the close of the fiscal year a quarterly letter was issued advising the shareholders that the market conditions arising in August had rendered advisable a curtailment of production, and that accordingly operations at Phoenix and Grand Forks had been suspended. It is not expected to resume work there until the market shall become more nearly normal.

"At Anyox the problems involved in economical smelting of the ores proved to be even more intricate than anticipated, but it is now believed that a very satisfactory solution has been reached. It would now appear, therefore, that we shall be fully ready at both properties to take advantage of improved market conditions when they shall arise.

"In the meantime, in common with other mining enterprises, we are curtailing expenses wherever practicable. A considerable reduction in salaries of officials, effective September 1st, has been made, at the suggestion of the officials themselves.

"The fundamental conditions, both as to property and the organization, are highly satisfactory."

#### ASBESTOS AS A BUILDING MATERIAL.

The marked increase in disastrous fires is directing more attention every day to the need of fireproof building materials that can be relied upon. The failure of many so-called fireproof materials when subjected to the intense heat of large conflagrations suggests the need of more careful judgment in the choice of these materials as well as a more stringent interpretation of fireproof building regulations.

The demand for building materials that would not be affected by fire has encouraged manufacturers to experiment with all kinds of materials, including asbestos.

Deposits of asbestos occur in Russia, Italy, Egypt, India, South Africa, and, in fact, in all parts of the world. But Canada is the chief producer of commercial asbestos. The H. W. Johns-Manville Co. uses Canadian asbestos.

This asbestos produces long silk fibres which are manufactured into fireproof goods of various kinds, the most familiar of which, no doubt, is the asbestos theatre curtain.

Asbestos fibres are made into felt, much as the felt for hats is manufactured. This felt is then saturated with Trinidad Lake asphalt, after which several sheets are cemented together with this material and thus made into ready roofings.

For shingles these same rock fibres are mixed with Portland cement and other ingredients, put in molds of various sizes and shapes and subjected to intense hydraulic pressure. The various colors are mixed with these ingredients, producing shingles of a number of handsome shades.

Asbestos wood or lumber is also made in very much the same manner as the shingles. This is furnished in slabs of varying sizes, so that it can be easily used for making fireproof partitions, fire doors, booths for moving picture machines, etc.

Another use that is made of this material is in stucco, and wall plaster. Here the asbestos fibre takes the place of hair ordinarily used and the asbestos takes the place of sand.

Asbestos is also much used as a pipe covering and in the form of mastic, for flooring.



# ANNUAL REPORT KERR LAKE MINING COMPANY

The report of the Kerr Lake Mining Co. for the year ending August 31, 1914, shows that in that period the company produced 1,828,424 oz. of silver at a cost slightly higher than in the previous year. The ore reserves show only a slight decrease.

Manager Robert Livermore says:

The gross production from all ores, for the year ending August 31st, 1914, amounts to 1,828,424 ozs. of silver. This figure includes 15,944 ozs. of silver on hand August 31st, 1914, according to inventory. Of the total, 1,196,401 oz. was produced from shipping ore, and 632,023 oz. from low grade ore milled by the Dominion Reduction Co., Ltd., at Cobalt.

Ore production for the year ending August 31, 1914:

Grade of Ore.	Net Weight, lb.	Silver Contents, oz.	Average Silver per ton, oz.
1st Class .....	542,197	1,015,043	4,193.83
Bullion from 1st .....		121,898	
2nd Class .....	55,994	26,731	954.78
Jig and table concentrates .....	44,986	22,925	1,019.21
Bullion from metallics ..		9,804	
Mill ore .....	18,682	632,023	33.83
	tons.		
		1,828,424	

August estimated in part.

## Development.

Development work was carried on at a rate slightly in excess of that of last year. Including drifting, cross-cutting, sinking and raising, 5,399.5 linear ft. was done as compared with 4,984 linear ft. in the previous year. During the last third of the year 2,513 ft. was trenched in exploratory work on surface in the lake basin and elsewhere. There were some new discoveries during the year, consisting partly of new veins, and partly of extensions to known ore bodies. Of the latter developments increased the silver contents of the Main East and Fleming veins, and of the former, Lake veins Nos. 1, 2 and 3, and No. 218, were added to the reserves.

At No. 3 shaft a long crosscut was driven westward from the sixth level to prospect the Keewatin-diorite contact, and to intercept No. 2 vein at that depth. A strong calcite vein was cut 400 ft. west of No. 3 vein in Keewatin formation. This is called the "Keewatin vein." Although nearly barren of value where encountered, the lead being strong was followed for several hundred feet, and the work resulted in opening a small body of milling and high grade ore, which has produced over 9,000 oz. of sacking ore to date. This pocket was found near the contact, and it is probable that the ore will be confined to that neighborhood. It is also probable that this vein is a continuation at depth of No. 2 vein, hitherto opened only on the second level. This vein may be a considerable producer, depending on the frequency of occurrence of ore pockets, but owing to their erratic nature estimates of even possible ore are entirely too uncertain to warrant making. A number of raises were put in on No. 2 vein on the second level and No. 21 vein, its continuation connecting with No. 7 shaft workings. One of these raises on No. 21 vein disclosed another pocket of rich ore, from which 3,000 oz. were taken, but this

proved to be very limited in extent. The development in these veins although yielding so far comparatively small production is important as showing the existence of ore in the more unfavorable formation, and in a little prospected part of the property, and gives encouragement for future developments.

At Little No. 3 shaft no new discoveries were made. A connecting raise was driven from the 140 ft. level of No. 7 workings, so that this part of the mine may be worked through the main shaft.

No. 7 shaft. Fleming vein—A 140 ft. winze was sunk from the 225 ft. level and drifts were run on the vein at 275 ft. and 325 ft. This latter level is now the deepest working in No. 7 shaft. Both of these drifts are in Keewatin formation. On the 325 ft. level, except for a short shoot of fair grade, no ore was found. It is apparent that this level is at the bottom of the pay ore in the vein. On the 275 ft. level the vein carries values of very fair milling grade, with occasional spots of high grade for over 200 ft. The draining of Kerr lake allowed a considerable area of the surface of this vein to be exposed by trenching, and where so exposed it was found to be divided into a number of leads, some barren or nearly so, and some very rich. On the whole the average value of the vein on surface is fully as good as that exposed in the nearest underground workings, the 195 ft. level, 60 ft. below. This development in the above named workings on the 275 ft. level has increased estimated value of the vein very considerably.

Main East vein—Some drifting was done on the fourth level, but the ore was not found at this depth. Since the vein has been thoroughly explored on the 140 ft. level, developments were confined to side veins and stringers in which small additions of ore were opened up. On surface this vein was exposed by the draining for its full length. The ore was found to be much better in width, length and value than underground, and the estimated content has been materially increased.

No. 218 vein—This vein is a branch of the Main East drifted on some years ago, but the work at that time exposed only a barren calcite lead. A short raise opened ore of good grade and a drift was run for over 100 ft. in the ore. Owing to the heavy overburden this vein has not been explored on surface.

Lake Veins Nos. 1 and 2—These were discovered by the draining last year, and though narrow are rich on surface. On the 140 ft. level they were followed up, but have not been so far productive. Better results may be expected at higher levels.

Nos. 28 and 29 veins—These were two narrow veins discovered by crosscutting on the 140 ft. level and although containing some high grade ore have not been productive to date.

Little No. 7 vein—A drift was run upon this at the 90 ft. level, which exposed a shoot of good ore 160 ft. long. The better value encountered here allowed an increase to the previous estimate for this vein.

Lake Vein No. 3—The most important discovery during the year was of the above vein, which was first exposed on surface after the mud level had been sufficiently lowered in the lake basin. It is a system of veins lying north of the Main East and connecting that vein with the Fleming. It lies in the north central area of the property, not hitherto explored owing to uncertainty as to the depth of ground. Although the main lead is comparatively narrow it has a very good high



average silver content, and has been exposed for over 200 ft. Crosscuts driven at the 140 ft. level cut this vein underground, and drifts have been run upon it for 240 ft. The average value at the 140 ft. level while not so high as on surface makes the vein with its adjacent stringers a very important addition to the reserves.

Crosscutting—Several long crosscuts were driven at different levels to explore the larger unprospected blocks, but these were with the exceptions above noted, unsuccessful in finding new veins.

Developments for the coming year will complete the openings through the still unprospected areas, such as the south central part in diabase formation, and the north-east corner in conglomerate formation, and will comprise following up any leads encountered as well as extending those already known. Close attention also will be paid to cutting up small blocks in favorable ground. More work will be done on the Keewatin or No. 2 vein, both at depth and in exploratory raising.

Developments for the year are given in detail below.

### Stoping.

During the year stoping was confined mostly to the older reserves of the mine, the largest amounts of silver being produced from No. 7 vein, the Big Chamber and No. 10 vein in order. Smaller amounts were taken from No. 15 and the McDonald. The estimated amount of silver in the blocks removed was well maintained, in fact, in most cases exceeded. It is found to be almost invariably the case that the silver content is greater in the higher levels of the mine, so that inferentially former estimates which were based on production from lower levels may be considered conservative. It will be noted that the reserves of No. 7 and the Big Chamber have been most largely drawn upon, and it is probable that during the coming year it will be found advisable to complete these stopes and fill with waste, to avoid the necessity of further supporting with timber. The McDonald has been little drawn upon during the year, and still shows a good reserve above the 140 ft. level. No. 10 vein is intact above this level, all stoping having been done in the lower levels. No. 15 vein is also in place above the 140 ft. level. No stoping has been done on the Fleming vein during the year except for a cutting-out stope on the new ore developed at the 275 ft. level. Also no stoping has been done in the Main East above the 140 ft. level. The square set method of timbering introduced last year has been found satisfactory, and has increased the safety of mining, and aided regularity of production.

Total development and stoping, September 1st, 1913, to September 1st, 1914:

	Development.	Stoping.
Drifting ft. ....	3,310.0	
Crosscutting ft. ....	1,747.0	
Raising ft. ....	285.0	
Sinking ft. ....	57.0	
Stoping sq. ft. ....		36,767
Side-cutting sq. ft. ....		333
Total . . . . .	5,399.5	37,100

Trenching, 2,513 ft.

Total development to date, 40,062 ft.

Production of individual veins for the year ending August 31st, 1914:

	Develop- ment Oz.	Stoping Oz.	Total Production Oz.
Vein System.			
Big Chamber ..		381,858	381,522
No. 7 .....		459,522	459,858

Little No. 7 ....	1,815		1,815
No. 8 .....		1,608	1,608
No. 10 .....		236,837	236,837
No. 15 .....		31,845	31,845
No. 18 .....		225	225
No. 21 .....	3,184	704	3,888
No. 218.....	14,227		14,227
McDonald .....		45,205	45,205
Main East ....		5,286	5,286
Fleming. ....	2,249		2,249
Lake Veins ....	2,749		2,749
Keewatin. ....	217	8,870	9,087
Total. ....	24,441	1,171,960	1,196,401
Mill ore .....			632,023

Grand total ..... 1,828,424

### Ore Sorting and Jigging Plant.

Apparent production from this source was small, owing to the fact that poor market conditions for ore of the grade ordinarily concentrated made it advisable to sort the products from the jigs, and to divide them between first class and mill ore. The total production is shown under the head of ore production; it amounts to 44,986 lbs., assaying 1,019.21 oz. per ton, a total of 22,925 oz. of silver.

### Mill Ore.

Production was kept up at a slightly higher rate than last year. The total production of silver was greater than that of last year, owing to the larger tonnage of better grade ore. Like the higher grade, the mill rock is found to have a greater silver content in the upper levels of the mine from which a large part of the tonnage was drawn. Of the 18,862 tons sent to the mill, 2,552 tons were taken from the dumps. Improvements and additions were made to the ore bins at No. 7 shaft. Due to the discovery of ore in the Keewatin vein, and the advisability of starting work on No. 3 dumps, the No. 3 ore house was remodelled and a receiving bin for mill ore was put in, from which the ore is teamed to No. 7. The No. 3 dump ore so far treated amounts to 533 tons, and shows a satisfactory grade of 42 oz. per ton.

Mining cost per ton of rock hoisted, August 31st, 1913, to August 31st, 1914:

Tons Hoisted—	
Ore. ....	33,955
Waste. ....	10,839
Total. ....	44,794

Sacking Ore—		Tons.
1st grade .....		271
2nd grade .....		28
Jig Concentrate .....		22
Total . . . . .		321
Mill ore .....		16,130
Waste from bumping tables .....		17,504
Total. ....		33,955

The following were the costs: 44,794 tons rock hoisted at a mining cost of \$5.09 per ton; 1,828,424 silver oz. at a mining cost of 12.49c. per oz.

### Lake Draining.

The work started in August of last year, and was continued up to the last of November, when the approach of winter stopped operations for the season of 1913.



During that time all of the water and a large quantity of liquid mud was removed, lowering the level of the lake some 40 ft. In May of the present year operations were resumed, and at the last of August the scow rested on bed-rock near the centre of the basin at a depth of 80 ft. below the original water line. The work this season consisted almost entirely of pumping the semi-liquid mud which was left after the water had been pumped out. Owing to the mud slipping down from the sides with the receding water, and the narrowing of the area of the basin, the original depth of the mud had been greatly increased. As it would not have been safe to mine to surface while it remained in liquid form, that mud which would flow to the pumps was handled. This was done without difficulty until the drying out of the exposed surface made it necessary to install a simple hydraulic apparatus to sluice down the loose material, and to cut a way through the underlying bed of clay which lies under the mud, to bed-rock.

This hydraulic apparatus consists briefly of small monitors mounted on the scow and others on tripods for use at some distance away from the scow. An auxiliary 1,000 gal. turbine pump was installed in the Giroux Lake pump house to supply extra water through a 6 in. line to the nozzles. With this apparatus satisfactory results have been had, and at the present time the actual draining operation is virtually concluded. The present work consists of enlarging the pump or basin in which the boat lies, and in cutting through the clay for proper drainage.

The sloping nature of the ground on the Kerr Lake Mining Co. property has resulted in there being but little accumulation of clay or mud, and active trenching operations have been carried on through such as remains to expose the veins. The exposure of the bottom by the draining has resulted favorably for the company by the discovery both of new veins, and of the fact that outcrops of known veins have invariably proven richer below. This is especially true of No. 10 and the Main East veins. Nos. 1, 2 and 3 Lake veins are new discoveries, but besides these there are numerous stringers, some containing rich ore which might be called separate veins, but which from their proximity to others have been included under one or another of the above numbers.

#### Drummond Fraction.

Work was started on this property in November. The lake draining early exposed a vein system containing mill and high grade ore. A 100 ft. shaft near the boundary was leased from the Cobalt Comet Co., and put in repair. An ore sorting plant with sorting table and receiving bin was built. Arrangements were made for receiving the ore at the Dominion Reduction Co., and in January the regular production was started. The mine has made a profit over operating costs since arriving at full production of mill ore, and ten tons of high grade ore have been sacked and are at present awaiting shipment; 2,514 tons, averaging 27.4 oz. per ton, have been milled. The reserves left in the one vein so far opened are not great, and the main hopes for the future of the property lie in thorough prospecting of the conglomerate area in the lake basin, which work is now being actively prosecuted.

#### Ore Reserves.

Estimates this year are based partly on previous production figures and partly on sampling. Figures given for the older reserves, such as the Big Chamber, McDonald, No. 7 and No. 10 veins having been checked or exceeded by subsequent production, have been allowed to stand decreased simply by the amount of high grade

ore removed during the year. Little No. 7, the Main East, No. 218, Lake vein No. 3 and the Fleming vein have been carefully sampled, and the more accurate method of estimation, together with the new development of these veins, has shown a satisfactory increase to their previously estimated value.

In some cases no distinction is made between high grade and mill ore owing to the difficulty of differentiating between the two products by sampling methods. An attempt has been made to arrive at the tonnage of mill ore by means of sampling and measurement, but because of the difficulty of getting accurate results by this method in the very variable ground which furnishes mill rock, the estimate has been kept purposely low. From the appearance of the lake bottom in the vicinity of the Main East and Fleming veins where the surface is a network of stringers which will undoubtedly furnish a very large tonnage of mill ore, it is safe to say that the present estimate will be exceeded. The estimates given may be considered as of positive ore.

Regarding probable and possible ore it is impracticable to give any definite figures. As mentioned above mill ore is liable to exceed the figures given. A considerable tonnage will undoubtedly be taken from No. 3 shaft from the Keewatin and No. 2 veins, also from various low grade veins not at present worked which are liable to contain better values nearer surface.

Under the head of possible ore there is still a favorable area in the north-east corner of the property, and late developments have shown that there are still possibilities in the Keewatin-diabase area in the south end of the property. An estimate of ore in reserve follows.

Estimate of ore reserves, Sept. 1st, 1914:

High Grade Ore—	Estimated Oz.
Big Chamber vein system .....	185,800
McDonald vein .....	708,700
No. 7 vein .....	409,900
No. 8 vein .....	66,000
Main East vein system .....	532,000
Xmas vein .....	49,900
No. 10 vein system .....	836,500
No. 15 vein .....	108,400
Little No. 7 vein .....	62,000
Lake No. 3 vein system .....	235,000
No. 218 vein .....	64,500
	<hr/>
	3,258,700
Mill and High Grade Ore Not Separated—	
Fleming vein system .....	1,200,000
Little No. 3, Nos. 2, 18, 21, 23-29	
Lake veins 1 and 2, Keewatin	
vein systems .....	40,000
	<hr/>
	1,240,000
Other milling ore .....	800,000
Dump ore .....	400,000
	<hr/>
Grand total .....	5,698,700

The treasurer reports that while the shipments for the year amounted to 1,845,055 oz. gross, the smelter settlements aggregate 1,670,933 oz. The difference is accounted for by the deductions made by the smelting works for losses and in the way of treatment charges.

The costs of production per oz. are as follows: Mining and development cost, 12.49c.; shipment and treatment charges, 11.61c.; administration and general, 0.76c. Total, 24.86c.

There has been written off on account of expenses connected with Kerr Lake-Crown Reserve drainage account the sum of \$6,200, leaving a balance of \$30,000, as at 31st August, 1914.



The Drummond Fraction development showing an asset of \$8,692.02 is more than covered by the value of silver on hand as at 31st August, 1914. The company has not taken any account of profits derived from this operation during the last fiscal year.

All construction expenditures during the year have been charged to operating expense, under the heading "Repairs to Plant and Buildings."

The following is a statement of the dividends paid by the company to August, 31, 1914:

In the year ending August 31—

1906. . . . .	\$90,000.00
1907. . . . .	210,000.00
1908. . . . .	360,000.00
1909. . . . .	480,000.00
1910. . . . .	990,000.00
1911. . . . .	1,200,000.00
1912. . . . .	690,000.00
1913. . . . .	600,000.00
1914. . . . .	600,000.00

Total. . . . . \$5,220,000.00

Balance Sheet—31st August, 1914.

#### Assets.

Mine property . . . . .	\$130,000.00
Buildings, plant and equipment . . . . .	33,351.21
Inventory of materials and supplies. . . . .	11,664.56
Ore on hand, sold and in transit, unsettled for, at estimated value . . . . .	108,180.38
Bank interest accrued . . . . .	416.81
Sundry debtors . . . . .	5,701.10
Cash. . . . .	93,333.13
Short term bonds . . . . .	256,598.49
Call loans (secured by collateral) . . . . .	350,000.00
Kerr Lake-Crown Reserve drainage account . . . . .	30,000.00
Kerr Lake-Crown Reserve drainage account. . . . .	30,000.00
Drummond Fraction development . . . . .	8,692.02
	<hr/>
	\$1,027,937.70

#### Liabilities.

##### Capital Stock—

400 shares at par value of \$100 each. . . . .	\$40,000.00
Accounts payable . . . . .	6,844.72
Accrued wages . . . . .	2,348.90
Reserve for accrued taxes . . . . .	15,150.14
Reserve for outstanding liabilities . . . . .	2,500.00

##### Surplus—

Balance 1st Sept., 1913. . . . .	\$954,308.27
Profit for year ended 31st August, 1914, as per Operating, Profit and Loss Account . . . . .	620,785.67

\$1,575,093.94

##### Deduct—

Dividends paid during the year. . . . .	614,000.00
	<hr/>
	961,093.94

\$1,027,937.70

Exclusive of dividend No. 36 of \$150,000 paid 15th September, 1914.

#### CONIAGAS.

Coniagas has declared a regular 6 per cent. quarterly dividend, payable on Nov. 1, but no bonus. This will make a total disbursement for 1914 of \$1,320,000.

#### TIMISKAMING MINING CO.

Mr. F. L. Culver, president and general manager, has issued the following report on the Timiskaming Mining Co., Limited, for the quarter ending September 30, 1914:

Your directors cannot report much additional development since June 30 owing to the fact that labor conditions were very unsettled, and on August 1 mining operations were suspended entirely. Since 1907, the Timiskaming Mining Company had been paying a higher rate of wages than was being paid by other companies in the Cobalt District, and the results were not in keeping with the wages paid. On July 1 notices to the employees were posted stating that, commencing August 1, the wages paid by the Timiskaming Mining Company would be the same as the wages paid by other mining companies throughout the district. The Local Miners' Union protested against this reduction, and petitioned the Government, under the Lemieux Act, for the appointment of a Committee of Conciliation and Investigation. The appointment of this committee prohibited the company from making any change whatsoever in the wage scale during this investigation, so your directors decided that on August 1 it would be good policy to suspend operations on the property until such time as the committee was ready to submit its findings to the Government. About the middle of September, a certified copy of the report of the committee was received from the Government, which your directors interpreted to mean that they were amply justified in equalizing the wage scale. During this temporary suspension, the plant was put in splendid condition for winter operation, also the hoist overhauled, which we believe will result in a great saving of fuel.

The main shaft is down to a depth of 768 feet; the station cut at the 750-foot level. A crosscut was started from this station to intercept veins No. 3 and No. 11, and a drift driven north to intercept vein No. 6. We also started to drift on a small vein leading south from the shaft, and at a distance of about forty feet we encountered an excellent showing of high-grade ore. Quite a bit of work has been done in the northern part of the property where we have splendid mill ore, but have not encountered any high-grade except in a sub-drift between the 500 and the 575-foot levels which, however, does not appear extensive. On October 1, six drills were started underground, when one or two shots in the drift on the 750-foot level, where we encountered the showing of high-grade, revealed results which are very encouraging. It is not the intention to resume operations at the mill until we have a very much larger tonnage of mill rock broken, and for this purpose more drills will be started as soon as practicable.

In the last circular letter sent to the shareholders it was stated that the North Dome Mining Company was indebted to the Timiskaming Mining Company, for monies advanced, approximately \$88,000. It seems that one or two very serious accidents had occurred on the North Dome property, and actions brought against that company for heavy damages, judgments being obtained, and writs put into the hands of the sheriff for execution. This necessitated the Timiskaming Mining Company immediately applying for a winding-up order against the North Dome Mining Company in order to protect its claim against that company, and this matter is now in the hands of the liquidator. The company's cash balance on September

30 was . . . . .	\$59,782.24
Less wages and accounts payable . . . . .	3,328.09
Available balance . . . . .	<hr/>
	\$56,454.15



# THE ELECTRIC FURNACE FOR STEEL MAKING

By Walter N. Croft

(Continued from October 15th issue)

A slag is made on the bath of steel by the addition of lime and sometimes flourspar and other slag forming materials. Ore is also added if the carbon in the bath is to be lowered. This first slag with the ore has an oxidizing action. The carbon is oxidized to CO and CO<sub>2</sub>, and the phosphorus in the steel is slagged off as calcium phosphate. This first slag reduces the phosphorus very greatly, but lowers the sulphur very little. After the phosphorus has been lowered to the desired point, this so-called phosphorus or oxidizing slag is rabbled off from the bath by tilting the furnace slightly. A second slag is now made by the addition to the bath of finely ground lime with some other materials for thinning the slag that is formed. Over this slag is thrown a thin layer of fine coke or charcoal. A reducing condition is thus obtained in the slag and the sulphur is removed from the steel to the slag as calcium sulphide ( $\text{FeS} + \text{CaO} + \text{C} = \text{Fe} + \text{CaS} + \text{CO}$ ).

The possibility of maintaining on the bath of steel at will, either an oxidizing or reducing slag is the feature that gives all kinds of electric furnaces their great advantage over the Bessemer or open hearth processes. In both of the latter processes, the heat of the steel is maintained by oxidation, either within the steel itself, or in immediate contact with the steel or its slag. In the electric furnace, the heat does not come from oxidation at all, and any considerable removal of sulphur can only be accomplished by a chemical reducing process.

In the making of electric steel after the phosphorus and sulphur have been lowered as far as desired, pig iron may be added to obtain the desired carbon content, and any other alloys, if alloy steels are being made. In passing, it should be noted that it has been found in electric furnace practice that there is a great saving in the amount of alloy required for a given final content in the steel; this is because, when the metallic alloys are added just before tapping, the slag and atmosphere in the furnace are either chemically neutral or reducing. In open hearth practice, the atmosphere and slag are almost always oxidizing, so that a portion of the alloy additions may be oxidized and pass off into the slag instead of steel.

Leaving the consideration of the chemical effect of slags, let us pass on to the chemical and physical condition of the finished steel in the ingot. It has been claimed ever since electric steel has been made that segregation in the ingot is eliminated, and the investigations made in the United States, as well as in Europe, seem to substantiate this claim to a surprising degree. It is well known to engineers that there is frequently a wide variation of carbon, phosphorus and sulphur at different points in a steel ingot; this variation is sometimes so great that it is very serious in its effect on the rolled product. This is a familiar subject to those who have anything to do with steel rails. In the case of electric steel ingots this segregation is negligible, sometimes being reduced to the variation due to the personal equation of the chemists making the analysis. It is an interesting fact concerning electrically made steel that it seems to be more dense than either Bessemer or open hearth steel, which is probably due to its greater freedom from occluded gas pockets, both of blow-hole, as well as microscopic size. In the

case of Bessemer steel, oxygen and nitrogen gas are blown through the metal and it is easily conceivable that large or small globules of these gases may be retained in the steel when it is poured. In this connection, it is interesting to note that it is quite common in European Bessemer practice to hold the heat of steel in the belly of the converter for twenty or thirty minutes after it is blown. This is done in order to give the metal time to "kill"; that is, for gases, as well as particles of slag, to separate from the metal and rise to the surface. In most mills in this country such a delay after each "blow" in a converter would doubtless be the occasion for a change in practice or a change of superintendent. But here again in European practice "delay" reports from a mill do not seem to be nearly so important as the quality reports, and a conscientious engineer would not care to criticize the European view. The ideal would be for the Americans to keep up their present speed in steel mill practice and at the same time attain to a quality of output corresponding to the European quality (taking into account, of course, the difference in raw materials).

## Future of Electric Steel Furnace.

As to the future manufacture and use of electrically made steel, one can speak publicly only in a very general way. Perhaps the best forecast for the future can be made by reviewing the present activities and then mentioning a few elements that may affect the production of electric steel in the future.

Electric steel furnaces were first used in Europe to make steel of tool quality. At first, only the lower grades of tool steel were made, but gradually furnace practice has been improved until now excellent tool steel (even high speed) is being made in the electric furnaces and at costs very much lower than are possible in the old crucible process.

The next step was the use of electric steel in small and intricate steel castings where the crucible or Bessemer process is used. In Europe the electric furnace has very largely superseded these two older processes for steel castings, although there are a few plants where excellent castings are still made from the Bessemer converter.

For some time in Europe and just lately in the United States, electric steel castings have been entering into competition with open hearth steel castings. In Europe there are several steel foundries making castings exclusively from electric furnaces and they are able to sell in competition with open hearth foundries. A considerable tonnage of electric steel castings is being sold in the United States by European steel foundries. The author believes that so far in this country electric furnaces have made no effort to lower their prices sufficiently to compete with the open hearth foundries. This is probably not yet possible on account of the higher costs than in the open hearth foundry, and also a lowering of price is not necessary since the electrically made casting has advantages that should sell it at a higher price even in competition with the open hearth foundry.

There has been, as yet, no great development of the electric furnace for the production of tonnage products. In Europe there are several plants using the electric furnaces for making steel for tubes, extra high



quality ingots for rolling or forging steel armor plate, projectiles, etc.; thus far in this country there has been very little development along this line.

In Germany there have been some electric steel rails made and they have given good service, but the makers have found it more profitable to use their electric furnace equipment for the manufacture of higher priced products such as castings and tool steels. The United States Steel Corporation has made the most progress in the production of tonnage products. Beside the manufacture of many different steels of various qualities for rolling and forging purposes, they have made and put into service on various railroads about 10,000 tons of steel rails made in the electric furnace. These rails have not been in service long enough to justify any statement as to their qualities as compared with Bessemer or open hearth rails. It can be said, however, that they are almost entirely free from such disadvantages as may be due to segregation in the steel. The electric steel rails roll much better than either Bessemer or open hearth rails.

In addition to this and perhaps most significant, experience thus far seems to indicate that electrically made steel rails have much greater resistance to shock, which is of importance in the consideration of rail breakage in service under the blow of the locomotive driving wheel. This apparently greater freedom from breakage is especially noticeable under conditions of extreme cold, when there is a great deal of trouble from the breakage of Bessemer and open hearth rails.

It is needless to say that electric steel rails are selling at more than \$28.00 per ton. You can buy them now from the Steel Corporation at \$1.80 per one hundred pounds, or between \$40.00 and \$41.00 per ton. Thus it will be seen that the present use of electric steel is somewhat limited, and it is the belief of the writer that it will continue to be so until certain difficulties in the production of electric steel are overcome.

It is very generally agreed that, while electric steel costs more, for most purposes better steel can be made in the electric furnace than is now possible by any other method. This being the case, a greater use of electric steel can come only from two causes. The first cause will be a demand by the consuming public for a steel of better quality even though the first cost of that steel may be higher. If the traveling public in a few years should wake up to the fact that danger from disaster due to rail breakage can be avoided (if future experience should prove this), the traveling public would demand safety even if the rails should cost \$40.00 per ton—and the high cost of living would be still further increased, but some of us might live longer than we would on the old Bessemer rail. The other cause of a greater use of electric steel will be a reduction in the cost of its manufacture. This reduction in cost is sure to come sooner or later, and it will come from three different sources.

First—The price of electricity may be reduced in the future. America has possibilities in this respect much greater than those of Europe and it has only begun to conserve its resources. The water powers will probably be running and making steel long after the coal supplies are exhausted.

Second—An improvement and enlargement of the present furnace designs that will lower the current consumption per ton of steel, and also reduce the cost of repairs and replacement, which is now higher than that of the Bessemer and open hearth.

Third—Development of a furnace in which it will be possible at a low current consumption to convert pig

iron directly into steel as is now done in the Bessemer or open hearth. In its present stage of development, the electric furnace is a second step for further refining steel, after the original pig iron has been made into steel and partially refined in the Bessemer or open hearth. As a matter of fact, the present electric furnaces can use to advantage only steel; they cannot use pig iron to any advantage. If, however, an electric furnace could be devised which would do away with that intermediate step of Bessemer or open hearth and would make and refine steel directly from the molten pig iron, a long step would be taken toward a better quality of steel at a cost equal to and perhaps lower than is now obtained in Bessemer and open hearth practice. Of course, this step is a long way off, but the author believes it will come sooner than many steel men expect.

In this paper, it has been the purpose to present the electric steel furnace as fairly as possible. While the author feels sure that electrically made steel will come into more and more general use, he does not believe that it is going to come rapidly. Many mistakes will be made, doubtless, both in its manufacture and its use, but the steel making art will profit even by the mistakes, and the honest effort of each individual (whether crowned with failure or with success) will have its small share in increasing the sum total of human knowledge.

#### NOVA SCOTIA STEEL.

With splendid success attending their efforts we learn that the Nova Scotia Steel & Coal Co., New Glasgow, N.S., are at present turning out approximately 170 shells per day for twelve pound field artillery guns for the Dominion Government.

About three weeks ago the work began after a series of experiments and since that time the output has been rapidly increasing from day to day. In addition to this a large quantity of raw material for the construction of similar shells has been forwarded to the Quebec Arsenal, where it will be used, the order upon which they are at present working is for 250,000 shells in all which will keep certain departments of the big concern busily engaged for the entire winter season.

It is stated that the extraordinary success attending the efforts of the company in shell production may give rise to the establishment of a department at the company's plant to be given over exclusively to the manufacture of munitions of war.

#### ICE IN HUDSON'S BAY.

St. John's, Nfld., Oct. 22.—Immense masses of ice, driven to and fro with every change of wind, have remained in Hudson's Bay throughout the summer and fall, according to officers of the steamer *Mona Venture*, under charter to the Canadian Government, which has just returned from the second of two trips this season to Port Nelson. The season's work at that port, where the Government is preparing a terminal for the Hudson's Bay Railway, is practically ended, and the other steamers which have carried men and materials there will leave shortly.

Surveying and meteorological parties which have been studying conditions in the bay will come out on the cruiser *Acadia*. Work on the breakwater in the Nelson estuary, where the Government plans to create a safe harbor, has made considerable progress, and it is expected that dredging will be begun next summer.



## PERSONAL AND GENERAL

Mr. W. E. Holloway, Pittsburg representative of Roberts & Schaefer Co., now has his headquarters at the home office, McCormick building, Chicago.

Mr. Stuart M. Thorne is manager of the Trethewey mine, Cobalt, succeeding Mr. Horace G. Young, who is now at Jualin, Alaska.

Mr. Geoffrey Pearson, third son of Lord Cowdray, was killed in France. He was captured while acting as a dispatch rider and unsuccessfully attempted to escape.

The Canadian General Electric Co. has issued bulletins on mine hoist equipment and on electric hoists designed to fill the gap between the hand chain block and the traveling crane.

Mr. A. L. Dean, for some years metallurgist for the Mt. Lyall Mining & Railway Co., at Queenstown, Tasmania, has removed from Quebec to Victoria, B.C.

Mr. Hermann C. Bellinger, of Spokane, Wash., last month went to Chile to make a report to the Branden Copper Co. on some of its property in that country.

Mr. M. K. Rodgers, of Santa Monica, California, last month paid a visit to the Granby Co.'s Hidden Creek copper mines and smelting works near Alice arm of Observatory inlet.

Mr. Frank E. Pearce, formerly of Baker City, Ore., is now superintendent of the Pingree mine, near Nelson, B.C.

Prof. Heinrich Ries has returned to Ithaca, N.Y., from Europe after having visited important mineral deposits on the continent. He is professor of geology at Cornell University, and is best known in Canada in connection with his investigations and reports on the clay deposits of the Dominion for the Canada Department of Mines.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, last month proceeded from Victoria to Stewart, Portland canal, in the neighborhood of which he examined the important mineral veins lately opened at considerable depth by the Portland Canal Tunnels Co.

The many friends in Ontario and elsewhere of Hon. Wm. Templeman, of Victoria, B.C., formerly Dominion Minister of Mines, will doubtless be pleased to read that he is now convalescent after having been ill for a while in the Royal Jubilee Hospital, Victoria.

Mention was made in the Journal on August 1 of Mr. Arthur L. Walker, professor of metallurgy at the Columbia University School of Mines, New York, having gone on a vacation visit to the Orient, and his intention to return via Suez Canal and Europe. Owing to the European war he has had to alter his plans.

Mr. J. W. Bryant, for several years in charge of mining properties in British Columbia for the Tyee Copper Co., was in Southern Russia during the summer.

Mr. Lorne A. Campbell, of Rossland, B.C., recently paid one of his periodical visits to the colliery, in southwestern Alberta, of the McGillivray Creek Coal and Coke Co., of which company he is president.

Mr. Lyman A. Carter, of Spokane, Washington, formerly in charge of the Bluebird mine, in the south belt of Rossland camp, British Columbia, last month attended a meeting in Rossland of the Rosalia Mining Co., when directors were elected and plans adopted for raising money to provide for resuming operations at the Bluebird.

Mr. W. D. Dalglish, in charge of the mineral section of the Canadian Government Exhibition Commission,

lately left Vancouver for San Francisco, California, after having completed arrangements for ensuring a fully representative display of British Columbia minerals being made at the Panama-Pacific Exposition next year. Mr. Wm. Thomlinson, who has been collecting the minerals, is supervising the work of packing and shipping them from Vancouver to San Francisco.

Mr. R. D. Fetherstonhaugh, who represents the Omineca Exploration Syndicate, of Edmonton, Alberta, returned to Vancouver, B.C., last month from an exploratory trip through parts of the Peace River and Omineca districts, placer ground and mineral claims in which have been acquired by the syndicate. The statement has been attributed to him in the press that there was this year a greater number of prospecting parties in those districts than for some years past, and that the outlook is promising for mining being done there in the near future.

Mr. F. August Heinze has again been spending two or three weeks in British Columbia, investigating conditions in connection with interests he holds in mineral claims, and in a large area of lands obtained years ago as a railway subsidy and now taxable.

Mr. A. W. McCune, of Salt Lake City, Utah, has been visiting mining properties he owns, situated in Ainsworth and Slocan mining divisions of British Columbia, on one or two of which it is intended shortly to do development work.

Mr. J. W. D. Moodie, of Britannia Beach, near Vancouver, B.C., general manager for the Britannia Mining and Smelting Co., was in New York last month meeting there the chief owners of the Britannia mines and concentrating works.

Mr. W. S. Ayres, of Hazelton, Pennsylvania, was one of a party of men from the United States lately at Copper mountain, Similkameen, B.C., in connection with the intended acquirement of a group of copper-bearing mineral claims there.

Mr. W. M. Brewer has returned to Victoria after having been for five months engaged in making investigations into mining conditions and obtaining information relative to mineral claims for the British Columbia Department of Mines. Mr. Brewer obtained many particulars of claims in the Skeena country between Hazelton and the coast, of the prospects for coal on Graham island of the Queen Charlotte group, and of mining in parts of Atlin mining division, on all of which he will report to the department.

Mr. K. B. Carruthers, superintendent of the Consolidated Mining and Smelting Co.'s Molly Gibson mine, in Nelson mining division, British Columbia, left that Province last month for Ontario to spend several weeks at Kingston and other places.

Mr. Jas. Cronin, well known in British Columbia in connection with the development of the St. Eugene lead mine in East Kootenay, of which he was manager during the several years of its greatest production, has returned to his home in Spokane, Washington, after having spent the summer and early autumn in the Babine Mountain section of the Omineca mining division, B.C., in which part of the Province is situated mining property he is largely interested in and has been developing.

Dr. Chas. W. Drysdale, of the Geological Survey of Canada, has returned from British Columbia after having spent the field-work season of this year in geo-



logical work, chiefly in the near neighborhood of Rossland, and about Ymir, in Nelson mining division. Among other parts he visited was a mining camp above Lost creek, distant from Salmo by road and trail about 15 miles, where a deposit of bolybdenite ore has been opened and from which a test shipment of a carload was made a short time ago.

Mr. C. D. Emmons, formerly of Eugene, Oregon, who for two or three years has paid periodical visits to Graham island, of the Queen Charlotte group, British Columbia, in connection with oil prospecting operations of a Vancouver organization, was again on the island last month. Near Otard bay a depth of 1,100 ft. had been reached in drilling for oil, and indications were said to be encouraging.

Mr. Robert R. Hedley, of Vancouver, B.C., is now at the Kellapa copper mine, on Mares island Clay-aquot mining division, on the west coast of Vancouver island.

Mr. W. S. Haskins, manager of the Silver Standard silver-lead group, on Glen mountain, Omineca mining division, B. C., lately paid his first visit to the copper mining camp on Rocher Deboile mountain, a few miles from New Hazelton.

Mr. John Hopp has returned to the Coast after having been on his several hydraulic placer gold mines in the neighborhood of Barkerville, Cariboo district of British Columbia. Beside his hydraulicking operations, Mr. Hopp has been engaged in prospecting with a Key-stone drill extensive beds of gravel at the "Meadows," Williams creek, with the object of ascertaining whether there is sufficient gold in the gravel to warrant the establishment there of a gold dredging enterprise.

Mr. W. S. Spencer Hutchinson, of Boston, Mass., last month examined some mining property situated in mountains near Kaslo, Kootenay lake, B.C.

Mr. Frank E. Lathe, chief chemist at the Granby Consolidated Co.'s smelter laboratory, Grand Forks, B.C., has been appointed assistant professor of metallurgy at Toronto University. Mr. Lathe graduated from McGill, Montreal, B.A. 1904, and B.Sc. 1907. He has contributed several exhaustive and instructive papers to the Transactions of the Canadian Mining Institute, and has also been a contributor to the technical press.

Mr. F. J. Longworth, for years with the British Columbia Copper Co. as superintendent of its Napoleon mine and mill, in the State of Washington; as assistant superintendent at its copper smelting works at Boundary district of British Columbia, and in other capacities, has joined the staff of the Western Union mine at Republic, Washington.

Sir Richard McBride, Premier and Minister of Mines for British Columbia, recently paid an official visit to Ottawa, and went thence to New York before returning to Victoria, B.C.

Mr. Edward C. Musgrave, a graduate from the Royal Military College, Kingston, Ontario, has been gazetted to a captaincy in the 60th Regiment, King's Royal Rifles, England. Mr. Musgrave had charge, as superintendent, of the Tyee copper mine, Mt. Sicker, Vancouver Island, B.C., from the time of its development as a prospect throughout the several years of its activity as the largest and most important producer, at that time, of gold-copper ore in the Coast district of British Columbia. Afterward he was manager of mines in Montana and Mexico, respectively, until he proceeded to England when troublous times came on in Mexico.

Mr. Geo. W. Otterson, manager for the Kildare Mines, Ltd., an Ottawa company operating on Slate

creek, in the Omineca gold field of British Columbia, has closed his placer mining work for the season and left the Omineca district for the coast.

Mr. M. E. Purcell, of Rossland, B.C., superintendent of the Consolidated Co.'s Centre Star-War Eagle group of mines, has been elected a vice-president of the Canadian Mining Institute in place of the late Mr. W. J. Sutton, of Victoria, B.C., who died last May. Mr. Thos. Graham, Chief Inspector of Mines for British Columbia, has been elected a Councillor of the Institute, to fill the vacancy caused by Mr. Purcell's becoming a vice-president. Both men are well known and active members of the Institute, in connection with the Western Branch particularly.

Mr. J. M. Ruffner has resigned as general manager for the North Columbia Gold Mining Co. and allied organizations, operating in Atlin mining division. Mr. Frank Breeze is now superintendent of the company's properties on Pine creek, succeeding Mr. A. D. Hughes, who has taken a "lay" on a Spruce Creek placer gold property.

Mr. Alex. Smith, for years manager of the Surprise mine, above Cody, Slovan division, B.C., will shortly leave for Ontario to spend the winter in that Province.

Mr. J. J. Streit has recovered from a long illness and is superintending operations at the John L. Retalack & Co.'s mines at Whitewater, Slovan, B.C.

Mr. Samuel W. Traylor, president of the Traylor Engineering and Manufacturing Co., N.Y., has been on a visit to the Granby Consolidated Co.'s smelting works at Anyox, Observatory inlet, B.C.

Mr. T. J. Vaughan-Rhys has gone to the Fort George district after having spent three months investigating mining properties in the neighborhood of New Hazelton, Omineca mining division, B.C.

Mr. D. J. Williams, formerly of Butte, Montana, continues in charge of the Montana Continental Development Co.'s mining work on Rocher Deboile mountain, in the Skeena district, B.C.

Mr. T. W. Gibson, Deputy Minister of Lands and Mines, returned to Canada improved in health after being for several months abroad. He is now in Northern Ontario.

Mr. P. E. Hopkins is in Toronto.

Mr. G. C. Bateman, consulting engineer for the Canadian Exploration Co., operating a gold mine at Long Lake, Ont., is now at the property.

Mr. Cyril Knight, Assistant Provincial Geologist of Ontario, has during the past field season been working in pre-Cambrian areas near Sault Ste. Marie. He has mapped areas at Thessalon and Echo Bay.

Messrs. A. G. Burrows and P. E. Hopkins, of the Ontario Bureau of Mines, have been working this summer in Northern Ontario gold fields. They have restudied and mapped in greater detail the geology of the Porcupine district.

Dr. W. G. Miller, Provincial Geologist of Ontario, during the past month has been with Mr. Knight examining pre-Cambrian formations near Sault Ste. Marie.

Dr. F. S. Pearson was in Toronto on Oct. 16.

Mr. Jas. McEvoy, who has been investigating coal lands in British Columbia and Alberta, has returned to Toronto.

Mr. W. C. West, superintendent of the Peterson Lake mine at Cobalt, has resigned to go to Florida.

Mr. A. C. Bailey, formerly manager of the Cobalt Townsite mine, has been appointed manager of the Porcupine Pet mine.

Mr. H. E. Cunningham, mill superintendent at the Hollinger mine, Porcupine, has resigned.



## SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

**Neglected fields.**—About the middle of October Mr. W. M. Brewer, a mining engineer who has been closely associated with mining in the Coast districts of British Columbia, Yukon and south-eastern Alaska for fifteen years or more, returned to Victoria from a five months' trip in parts of the Skeena and Atlin districts, and to Graham island, of the Queen Charlotte group. One part of the Skeena country that had his close attention was that drained by several tributaries of Skeena river entering that stream near Kitsumkalum, Copper City, and Kitsalas, respectively—the Zymoetz or Copper river and Gold creek flowing from the east, and the Kitsumkalum from the north. For 30 to 40 miles back from the Skeena on both sides of the river, in country through which pass the several streams mentioned, and others in regions just beyond, there is, in Mr. Brewer's opinion, much ground well worth prospecting, for already some good showings of mineral have been found, and the general character of the country seems to be favorable to the occurrence of much more mineral than has yet been discovered. Earlier, when there were not any transportation facilities other than by river steamers or boats, and those not available all the year round, it was not surprising that comparatively little prospecting was done, but now that the Grand Trunk Pacific Railway is completed along Skeena river, giving convenient and rapid connection with Prince Rupert, it is surprising that so little effort is being made to find and develop the mineral deposits of this district within the distance stated above. In some instances gold-bearing quartz of good average value has been found to occur, in others silver or copper, or both. Horse trails to the outlying parts and wagon roads here and there along the river, or connecting with the railway in the valley of the Skeena, assist in making the country accessible in larger measure than is the case in many districts where not much prospecting has been done. Yet over quite wide areas of this country little or no prospecting is being done, at which fact Mr. Brewer expresses genuine surprise, bearing in mind the promising nature of the country and the excellent showings of mineral opened in a few places here and there in this part of the district.

Again, in parts of Atlin mining division, conditions appear to be somewhat similar. The gold quartz property, known as the Engineer or Northern Partnership group, is undoubtedly one that in some mining countries would occasion so much practical interest that many prospectors would spend much time and labor in trying to find other veins similarly gold-bearing. Yet there is little if any effective work being done in the country around the Engineer group. Then, as to placer gold mining. Of course the various streams from which approximately \$6,000,000 worth of gold has been won since the opening of this gold field in 1898 are becoming worked out, but these do not constitute all the placer gold bearing country in this easily accessible part of Atlin mining division. O'Donnell river has during the 1914 season had more attention in the direction of actual mining than ever before, but it is stated that although this stream has a length of about 50 miles, only about one-third has been taken up. If this be so, it certainly appears to be remarkable that more prospectors and placer miners are not in that country. If the comments here made were based upon the opinions of a man unacquainted

with mining conditions and indications of the occurrence of mineral, they might be regarded as what is often styled—and frequently rightly so, too—mere newspaper talk; but they have been prompted by the deliberately stated views of a man well qualified to judge what the prospects are for success, and he expresses much surprise that a mining country easily within reach of prospectors and giving indications of the presence of much mineral is so generally neglected by men fitted for prospecting.

**Cariboo.**

Now that the gravel-washing season is at an end for 1914, the news coming from the Cariboo gold fields is of more than usual interest, since it tells of what has been accomplished, while earlier in the year it was rather what was expected to be done. No figures known to be reliable have yet been received in Victoria relative to the gold yield of the year, but there appears to be general agreement that at least as much gold has been recovered this year as last. The official figures for 1913 of the three divisions included in Cariboo district were as follows: Cariboo \$131,000, Quesnel \$30,000, Omineca, \$6,000; total \$167,000. It is to be expected that this year's production will be found to have exceeded that of 1913, for the water supply was fairly good, and the number of placer mines worked quite as large.

**Cassiar.**

From Atlin has come preliminary news generally favorable as to the gold production during the season just ended. Here, too, the information is general, but it indicates that there has been a larger recovery of gold from Atlin creeks in 1914 than in 1913. Last year's total for placer gold was \$315,000, and for lode gold \$28,000. The latter amount may not have been reached this year for lode gold, the Engineer group having been inactive for a good part of the year, owing to an option of purchase having been given to prospective buyers, during the time of whose examination, and since then, only a little development has been in progress, with less ore taken out and crushed than in 1913. On the whole, the accounts of the year's results seem to show that they will be found to have been better than those of any other year since 1907.

**East Kootenay.**

The quantity of ore received at the Consolidated Co.'s smelting works at Trail from metalliferous mines in Fort Steele mining division during nine months ended September 30, is 24,810 tons, of which 949 tons was from the company's St. Eugene mine and the whole of the remainder from its Sullivan group mines.

In the Crowsnest district, coal mining has continued to be quiet, with some of the mines being worked three or four days a week and others only half time.

**West Kootenay.**

**Ainsworth.**—Mines in this division shipped to Trail during the three expired quarters of the year 14,243 tons, of which 5,076 tons was from the Consolidated Co.'s No. 1 mine, 3,008 tons from its Highland mine, and 4,954 tons from the New Canadian Metal Co.'s Bluebell mine. Of eight smaller shippers, the Maestro shipped 703 tons and the Utica 308 tons.

Early in October ore was received at Trail from the J. L. Retallack & Co.'s Whitewater group of mines. The Eagle Lode Mining Co., of Spokane, is reported to be likely to have its bond on the Eureka cancelled;



this company has been doing development work, but the crosscut adit driven did not reach the ore before the work of driving for it was stopped. A published report is to the effect that mining zinc ore in Jackson basin is to be commenced shortly by Spokane men.

**Slocan.**—Quite recently the Nelson "Daily News" quoted Mr. G. A. Carlson, of Spokane, one of the syndicate that for more than a year has been doing deep-level development on the Payne property, as its authority for a report that an excellent showing of ore had been opened from the low level at which driving has been done. It has been announced that raising from the low level to the old workings some 800 ft. above is to be undertaken during the ensuing winter, and that about 20 men will be employed on the property.

Small shipments of ore have been made lately from the Ruth, near Sandon; the Surprise, above Cody; and the Hewitt-Lorna Doone group of the Silverton Mines, Ltd. No silver-lead ore nor concentrate is being shipped to Trail from the Standard mine, but zinc ore is being sent to a smelter in the United States.

**Nelson.**—There is little to add to the news sent two weeks ago of mining in this division. Ore shipments continue to be very light, only an occasional car of gold concentrate from the Queen mine, Sheep creek, and some lead ore from near Salmo.

**Rossland.**—The output of the mines in Rossland camp constitutes by far the larger part of the total of ore received at Trail during the nine expired months of the year. The total quantity, as shown by published figures, of ore received was 293,049, of which 207,881 tons was from Rossland mines. The figures of individual mines are as follows: Centre Star group, 130,317 tons; Le Roi, 62,590; Le Roi No. 2. Co.'s Josie group, 14,936; and Bluebird, 38.

#### General.

There is little change in the Boundary district, the large mines still being inactive. The discovery of more ore of good grade has been reported from Franklin camp, up the North Fork of Kettle river.

On the west coast of Vancouver island work is being continued at the Kallapa group, in Clayoquot division. The coal mines are finding an active demand for their product, and a continuance of this favorable condition is expected.

From Stewart, at the head of Portland canal, the information has been received to the effect that developments continue to be encouraging in the deep of the mine of the Portland Canal Tunnels, Ltd.

### NOVA SCOTIA

**Dominion Coal Outputs.**—The production of the Dominion Coal Company's mines at Glace Bay and Springhill to the end of October, compared with the corresponding period of 1913, is roughly as follows:

Glace Bay mines—	1913, tons.	1914, tons.
October. . . . .	438,272	390,000
10 months ending Oct..	3,965,979	3,730,000
Springhill mines—		
October. . . . .	32,608	36,000
10 months, ending Oct..	318,510	341,000
Total—		
October. . . . .	470,880	426,000
10 months ending Oct..	4,284,489	4,071,000

These figures show a total decrease over the ten months of 1914, ending October 31st, as compared with the corresponding period of 1913, of approximately 213,000 tons.

The Springhill collieries, it will be noted, show an appreciable increase over last year's production, and these mines have worked without interruption throughout the whole year.

Some new hoisting records were made during the first half of October at the Glace Bay collieries. On the 8th October the combined shaft at No. 2 colliery produced 5,800 tons, 3,918 tons from the Phalen side and 1,882 tons from the Harbor seam. It will not be surprising to see a production of 6,000 tons in one shift from this shaft in the near future. No. 22 colliery (Birch Grove) is now producing over 700 tons daily, and No. 11 colliery has passed the 500 ton mark. No. 16 colliery is producing over 1,300 tons daily. Although the market conditions have very considerably restricted the total production of the collieries, the rate of production of the individual collieries is unusually high, and it would not have been a difficult matter, had the outlet allowed, to have raised 500,000 tons from the Glace Bay mines in October.

For a good many years past the mines of the Dominion Coal Co. have been working at high pressure, and the mines have worked every day except legal holidays, Sundays and occasional idle days in the winter caused by weather conditions. Since the commencement of last winter and during the summer just past there has, however, been some idle time, but not so much as many persons may have imagined. For the twelve months ending 30th September—the fiscal year of the Nova Scotia Mines Department—the collieries have worked an average of between twenty and twenty-one days per month, meaning that each colliery has had from four to five idle days per month. In view of the trade depression and the war it would not have been surprising had conditions been much worse.

The coal-banks—which were unusually large this season—have all been loaded up and shipped away.

### COBALT, ELK LAKE, GOWGANDA, SOUTH LORRAINE

**Cyanide.**—There is now no longer any danger of the mills using cyanide in the Cobalt or Porcupine camps being handicapped by shortage. The price has indeed gone up appreciably, but it is now announced that avenues have been found for meeting all reasonable supplies of cyanide. A month ago the danger of the shutting down of various mills was far more immediate than was generally known at the time.

Zinc dust has also gone up in price, and the supply of it on this side of the Atlantic is none too adequate.

The shortage of cyanide would now be a very serious matter to the camp since a large tonnage is being reduced to bullion before being shipped. The Nipissing alone produced \$351,000 in bullion last month from its own and customs ore, and the Dominion Reduction and O'Brien also ship largely. The production of silver from Cobalt would have been seriously diminished by any shortage of cyanide.

**Nipissing.**—During the month of September the Nipissing Mining Co. mined ore of an estimated net value of \$202,243, and shipped bullion from Nipissing and customs ore amounting to \$351,424.

Below the fourth level of shaft 73 a winze is being started at the eastern end of the 540 ft. drift to determine the depth of the Keewatin and also to establish a fifth level. At the beginning of the month it was down 17 ft.



A raise from the eastern end of the fourth level showed 85 ft. of ore, at which point the vein was small and faulted. A crosscut was started at the top of the raise, and at a distance of 15 ft. encountered a vein assaying 800 oz. over a width of 1 in.

Further development on branches of vein 98 have been generally satisfactory. A fifth vein connecting two other branches assays 500 oz. over a width of 1 in. No better news is available from the drifting of the main vein at 900 ft. at the 64 shaft. The drift to the east still runs from 6 to 8 in. wide, but assays very low in silver. Drifting will be continued until a point is reached vertically below the good ore shoots.

Of the total production for the month \$115,397 came from high grade ore and \$86,845 from low grade.

**Peterson Lake.**—It is with much regret that mining men of Cobalt heard of the resignation of Mr. W. C. West, who for the past year has been superintendent of the Peterson Lake Mining Co. Mr. Lamb has made a good record of development at the Peterson Lake. It is understood that Mr. West resigns mining in order to take up farming in Florida. Mr. West has put in most of his career in the sub-tropics and he is looking forward to getting back into a part of the world where mackinaws are not essential for several months in the year.

**Elk Lake.**—It is stated from Elk Lake that as soon as the road out to the mine is put in repair the company will resume work. In the bush fires this summer all the buildings were burned at the mine, and these will have to be replaced. At the same time the bridges on the road were burned and the company is hoping that the Government will soon replace them.

**Dividends.**—Two Cobalt mining companies have dropped their bonus disbursements in the past two weeks. Instead of paying twelve and a half per cent. the Seneca Superior paid 10 per cent. on Oct. 15th. This company has now returned to the original shareholders 125 per cent., the total issued capital being less than \$500,000. It is understood that developments at the mine since work was resumed at full blast are quite satisfactory.

Coniagas has declared no bonus with the six per cent. quarterly dividend.

**Hudson Bay.**—As the main shaft of the Hudson Bay mines has been shut down, and it is very problematical whether the working at No. 2 shaft will yield ore, the total of 5,604,168 oz., valued at \$2,965,523, may be accepted as the final output from the famous old mine. The total investment was only \$7,761 by its incorporators, all New Liskeard men. The end of the ore at the No. 1 shaft was reached in June, and the mine was promptly closed down. The production for the last year of the company's existence was 393,360 oz. of silver, valued at \$196,435.

While no ore has yet been found by the Hudson Bay at the No. 2 shaft, south of the McKinley Darragh, yet the manager, Mr. A. H. Brown, views the possibilities of a good discovery as by no means remote.

It was stated at the annual meeting that the company now holds 540,000 shares out of the 940,312 issued of the Dome Lake Co., and that development work is very satisfactory to date. The entire board of directors was returned.

## PORCUPINE, KIRKLAND LAKE, SWASTIKA

**Hollinger.**—One of the big compressors is now running in the new power house belonging to the Canadian Mining and Finance on Gillies Lake, and under-

ground operations have already been extended. There are twenty-six faces of ore on the Acme alone, and recently only two drills have been working on this private property of the Timmins-McMartin-Dunlap syndicate. Many of the extra drills will be set up there. The outlying shafts of the Hollinger, which have been lying idle for the past month or so will be opened up again and more drills will be set up to assist in the sinking of the big main shaft. So far there has been barely enough power to keep ore broken ahead of the mill, now it will be possible to set up drills on development and exploration work to a much greater extent. There are many faces of ore in the mine that have been left until it was possible to obtain more air.

**Dome.**—During September the ore at the Dome ran two cents a ton higher than in the preceding month of August. The tonnage was also higher, but the most noteworthy feature was the high extraction. This was raised to the ratio of 99.301 per cent. as against 90.893 per cent. in August and 97.454 as a previous best in April of this year. As September was nearly two thousand tons higher than the previous month in ore treated and the grade has been gradually creeping up since May, it is certainly the best month as regards profits since early this year. As Mr. Keading has also been cutting costs the profits are growing at both ends of the scale.

**Sesikinika.**—As a consequence of several applications for leases from private parties, the Timiskaming and Northern Ontario Railway has asked for tenders for the right of way at the Sesikinika camp, between mile posts 175 and 178. The section includes some 36 acres of land on both sides of the railway track. The term of lease is 999 years, with a ten per cent. royalty.

The Timiskaming and Northern Ontario leased the right of way at Cobalt with greater profit to the Right of Way mine, but to none other of the many companies that took up leases.

**Dome Lake.**—Once more stamps are dropping in the Dome Lake mill. They have been idle for more than a year, since the Timiskaming and Hudson Bay took over control and deemed it wise to shut down the mill until there was more ore in sight.

**Vipond.**—The Vipond mill is now running smoothly. The third clean-up has been made with entirely satisfactory results. Underground, too, development is producing good results.

**Pearl Lake.**—The sale of the plant on the Pearl Lake gold mines is announced. The sale only affects the plant, not the property nor the buildings.

**The Canadian Exploration Co.** is shipping gold bullion to the Ottawa mint. In October the production was about \$20,000. The Long Lake mine, near Naughton, is now making a small profit from the treatment of highly refractory ore. During the past three months the tonnage has been raised very considerably, and the consumption of cyanide in the mill per ton of ore treated greatly reduced. Ore was previously largely furnished from an open cut but is now being obtained from a stope at the 180 ft. level.

## NEW MAPS.

The Canadian Geological Survey has just issued two new maps. Map 136A is a topographic map by W. W. Leach, of the Hazelton and Aldermere areas, Cassiar and Coast Districts, B. C. The second is a topographic map of the Craig mine property, Raglan twp, to accompany a Memoir by the late A. E. Barlow.

## MARKETS

## STANDARD STOCK EXCHANGE.

October 26, 1914.

## Cobalt—

	Ask.	Bid.
Bailey. . . . .	.00 $\frac{5}{8}$	.00 $\frac{1}{2}$
Beaver. . . . .	.21	.19
Buffalo. . . . .	.85	.75
Chambers Ferland . . . . .	...	.11
Coniagas. . . . .	6.25	...
Crown Reserve . . . . .	1.01	...
Foster. . . . .	.05	...
Hudson Bay . . . . .	50.00	30.00
Kerr Lake . . . . .	...	4.20
La Rose . . . . .	.80	.75
McKinley Darragh . . . . .	.45	.42
Nipissing. . . . .	5.20	5.00
Peterson Lake . . . . .	.23 $\frac{1}{4}$	...
Timiskaming. . . . .	.09 $\frac{1}{2}$	.09
Wettlaufer . . . . .	...	.04 $\frac{1}{2}$

## Porcupine—

Dome Extension . . . . .	.08 $\frac{1}{2}$	.05 $\frac{1}{4}$
Dome Lake . . . . .	.33	.31
Dome Mines . . . . .	6.51	...
Foley. . . . .	...	.20
Homestake. . . . .	.20 $\frac{3}{4}$	...
Hollinger. . . . .	18.40	17.90
Jupiter. . . . .	...	.05 $\frac{1}{2}$
McIntyre. . . . .	.26	...
Pearl Lake . . . . .	.02 $\frac{1}{4}$	...
Porcupine Imperial . . . . .	.01 $\frac{1}{2}$	...
Porcupine Vipond . . . . .	.17 $\frac{1}{2}$	...
Rea Mines . . . . .	...	.10

## STANDARD EXCHANGE.

The minimum scale fixed by the Exchange, and below which no sales are permitted, is as follows:—

## Cobalts—

Beaver . . . . .	.17
Buffalo . . . . .	.75
Chambers-Ferland . . . . .	.10
Canadian . . . . .	.05
City of Cobalt . . . . .	.30
Cobalt Lake . . . . .	.30
Coniagas . . . . .	6.00
Crown Reserve . . . . .	1.00
Great Northern . . . . .	.04
Hudson Bay . . . . .	30.00
Kerr Lake . . . . .	4.00
La Rose . . . . .	.70
McKinley-Darragh . . . . .	.40
Nipissing . . . . .	4.75
Peterson Lake . . . . .	.23
Seneca Superior . . . . .	2.00
Timiskaming . . . . .	.07
Trethewey . . . . .	.12
Wettlaufer . . . . .	.04 $\frac{1}{2}$
York, Ont. . . . .	.07

## Porcupines—

Dome Extension . . . . .	.05
Dome Lake . . . . .	.30
Dome Mines . . . . .	6.50

Foley O'Brien . . . . .	.20
Hollinger . . . . .	16.00
Homestake M. F. . . . .	.20
Jupiter . . . . .	.04
McIntyre . . . . .	.27
Pearl Lake . . . . .	.02
Porcupine Crown . . . . .	.75
Porcupine Peterson . . . . .	.25
Porcupine Vipond . . . . .	.17
Rea Consolidated . . . . .	.10
Teck Hughes . . . . .	.07
West Dome . . . . .	.05

## TORONTO MARKETS.

Oct. 26—(Quotations from Canada Metal Co., Toronto)—

Spelter, 5 $\frac{1}{2}$ cents per lb.
Lead, 4 $\frac{1}{2}$ cents per lb.
Tin, 33 cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 12 $\frac{1}{2}$ cents per lb.
Electrolytic, 12 $\frac{1}{2}$ cents per lb.
Ingot brass, yellow, 10 cents per lb., red, 12 cents per lb.

Oct. 27—Coal—(Quotations from Elias Rogers Co., Toronto)—

Anthracite, \$7.75 per ton.
Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Oct. 23—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, \$1.60 per ton.
Foundry coke, prompt, \$2.10 to \$2.50 per ton.

Oct. 23—Tin, straits, 31.75 cents.

Copper, Prime Lake, 11.37 $\frac{1}{2}$ to 11.62 $\frac{1}{2}$ cents.
Electrolytic copper, 11.25 to 11.35 cents.
Copper wire, 12.75 cents.
Lead, 3.50 cents.
Spelter, 5.10 to 5.20 cents.
Sheet zinc, (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 15.00 to 15.50 cents.
Aluminum, 18.00 to 18.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, \$48.00 to \$50.00 per ounce.
Platinum, hard, 10 per cent., \$51.00 to \$52.00 per ounce.
Bismuth, \$2.75 to \$3.00 per pound.
Quicksilver, \$47.50 per 75-lb. flask.

## SILVER PRICES.

October—

New York cents London pence

8. . . . .	52 $\frac{3}{8}$	23 $\frac{1}{8}$
9. . . . .	51 $\frac{3}{4}$	23 $\frac{5}{8}$
10. . . . .	51 $\frac{3}{4}$	23 $\frac{3}{4}$
12. . . . .	...	23 $\frac{5}{8}$
13. . . . .	51 $\frac{3}{8}$	23 $\frac{1}{2}$
14. . . . .	51 $\frac{1}{2}$	23 $\frac{1}{2}$
15. . . . .	51 $\frac{3}{8}$	23 $\frac{3}{8}$
16. . . . .	50 $\frac{7}{8}$	23 $\frac{1}{8}$
17. . . . .	50 $\frac{7}{8}$	23 $\frac{1}{8}$
19. . . . .	50 $\frac{1}{2}$	23
20. . . . .	50 $\frac{3}{8}$	22 $\frac{1}{8}$
21. . . . .	50	22 $\frac{1}{8}$
22. . . . .	50	22 $\frac{1}{8}$
23. . . . .	49 $\frac{5}{8}$	22 $\frac{1}{8}$



# JUDICIAL SALE of ASSETS of The Swastika Mining Company, Limited

Tenders will be received addressed to "The Master-in-Ordinary, Osgoode Hall, Toronto," and marked "Tenders re The Swastika Mining Company, Limited," up to eleven o'clock A.M. of the 15th day of December, 1914, for the purchase of all the Assets (en bloc) of the above-named Company. A short statement of Assets is as follows:—

**Properties:** Parcels Nos. 8414, 8415, 8416, 8410, 8412 in the Register for Nipissing for which patents have been issued, and Parcels 16358 and 16359 in the Temiskaming Mining Division and 12619 Larder Lake Mining Division, upon which last three all assessment work is said to have been performed, but for which Patents have not yet been obtained, and Mining Rights in claims 16418 and 16419 Larder Lake Mining Division Subject to completion of assessment work

The Company's expenditures in developing, prospecting, etc., are shown by the books of the Company to amount to \$130,964.85.

**Buildings:** These are said to consist of Office and Store Room, Oil House, Engine Room, Shaft House, Mill, Cook House and Sleeping Camp, Ice House, Assay Office, Pump House, Stable, four Dwelling Houses and two Log Shacks.

The cost of construction of buildings, including main shaft construction, etc., is shown by the books of the Company at \$48,953.96.

**Mine Machinery, Equipment and Supplies:** This includes the Mill Equipment, Pipe and Water Line, 1 Sullivan 9 drill Compressor, 1 Jenckes Hoist, 2 125-h.p. Jenckes Boilers and 1 Chalmers & Williams No. 12A. Mortar with five stamps complete—book value \$51,689.65.

Inventories may be examined at the Office of the Liquidator to whom application should be made for inspection of the assets.

The properties of the Company upon which operations were carried on immediately adjoin the Town of Swastika which is on the Main Line of the Temiskaming and Northern Ontario Railway, a little north of Englehart.

**Terms of Sale:** Twenty-five per cent. in cash and the balance secured to the satisfaction of the Liquidator.

A marked cheque, payable to the Liquidator for ten per cent. of the amount of the tender must accompany each tender which will be returned if the tender is not accepted.

The tenders will be opened by the Master-in-Ordinary at his Chambers, Osgoode Hall, Toronto, on the 15th day of December next, at the hour of eleven o'clock A.M. All who tender are requested to be present.

The highest or any tender not necessarily accepted.

The other conditions of the sale are the standing conditions of Sale of the Court as far as applicable.

For further particulars apply to the Liquidator or its Solicitors.

Dated this 21st day of October, 1914.

THE TRUSTS AND GUARANTEE COMPANY, LIMITED,  
45 King Street West, Toronto, Ont.  
Liquidators.

MESSRS. ROWELL, REID, WOOD & WRIGHT,  
48 King Street West, Toronto, Ont.  
Solicitors for the Liquidator.

## Lindgren—MINERAL DEPOSITS



By WALDEMAR LINDGREN, Professor of Economic Geology, in charge of the Department of Geology, Massachusetts Institute of Technology; Geologist, United States Geological Survey.

883 pages, 6x9, 257 illustrations, \$5.00 (21s) net, postpaid

For many years Mr. Lindgren has been Geologist of the United States Geological Survey.

In this time he has come to be generally recognized as the leading authority on ore deposits.

The publication of this work on "Mineral Deposits" has been anticipated throughout the world.

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

#### CANADA

Prospector's Handbook No. 1. Notes on radium-bearing minerals, by Wyatt Malcolm.

Museum Bulletin No. 2. Contains short scientific papers.

Summary Report of the Geological Survey for the year 1912.

#### NEW BRUNSWICK and NOVA SCOTIA

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

Memoir 44. Clay and Shale Deposits of New Brunswick, by J. Keele.

#### QUEBEC

Memoir 22. Preliminary Report on the Serpentine and Associated Rocks of Southern Quebec, by John A. Dresser.

Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.

#### ONTARIO

Memoir 40. The Archaean Geology of Rainy Lake Re-studied, by Andrew C. Lawson.

#### NORTH-WEST PROVINCES

Memoir 47. Clay and Shale Deposits of the Western Provinces, Part 3, by Heinrich Ries.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

#### BRITISH COLUMBIA

Memoir 19. Mother Lode and Sunset Mines, Boundary District, B.C., by O. E. LeRoy.

Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.

#### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

#### CANADA

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Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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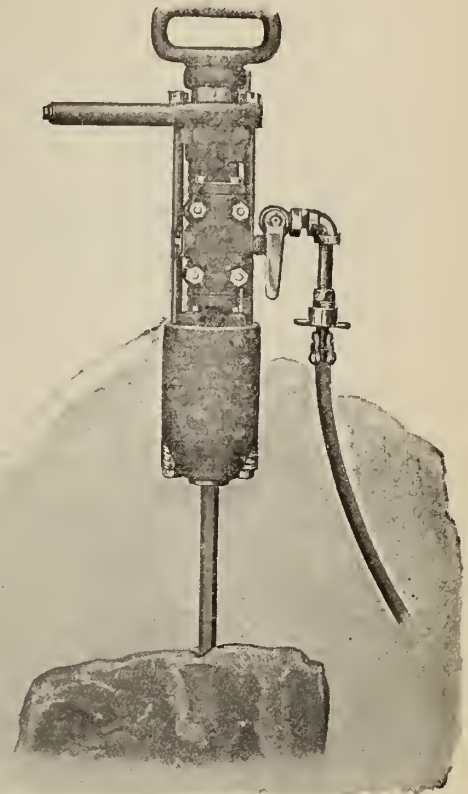


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Cyanide of Sodium 128/130  
per cent.

Cyanide of Sodium 120 per  
cent. In Brick form.



# The Canadian Miner's Buying Directory.

## Air Hoists—

The Herbert Morris Crane & Hoist Co., Ltd.  
Jenckes Machine Co., Ltd.  
Canadian Ingersoll-Rand Co., Ltd.

## Amalgamators—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

## Assayers and Chemists—

Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York  
Thos. Heys & Son.

## Assayers' and Chemists' Supplies—

C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lymans, Ltd., Montreal, Que.  
Stanley, W. F. & Co., Ltd.  
Peacock Bros.

## Ball Mills—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
The John Inglis Co., Ltd.

## Beams—Steel—

Canadian Allis-Chalmers, Ltd.  
Dominion Bridge Co.  
Mussens, Ltd.

## Belting—

Canadian H. W. Johns-Manville Co., Ltd.  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Jones & Glasco  
Canadian Fairbanks-Morse  
Federal Engineering Co.,

## Blasting Batteries and Supplies—

Canadian Allis-Chalmers, Ltd.  
Thomas & William Smith  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada), Limited.  
Mussens, Ltd.  
Northern Canada Supply Co.

## Blowers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.

## Boilers—

Mussens, Ltd.  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
The John Inglis Co., Ltd.

## Buckets—

Rock & Power Mach'y, Ltd.  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.

## Buildings—Steel Frame—

Dominion Bridge Co.  
Canadian Allis-Chalmers, Ltd.

## Cable — Aerial and Underground—

Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.

## Cableways—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Cages—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Jenckes Machine Co., Ltd.

## Cables—Wire—

Northern Electric Co., Ltd.  
Standard Underground Cable Co. of Canada, Ltd.

## Carbon (Black Diamonds and Bortz)—

Abe. Levine

## Cars—

Jeffrey Mfg. Co.  
Mussens, Ltd.  
Northern Canada Supply Co.

## Cement Machinery—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jenckes Machine Co., Ltd.  
Northern Canada Supply Co.  
Peacock Bros.

## Chains—

Jeffrey Mfg. Co.  
Peacock Bros.  
Jones & Glasco  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co.  
B. Greening Wire Co., Ltd.  
Northern Canada Supply Co.

## Chain Blocks—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Chemists—

Canadian Laboratories.  
Campbell & Deyell  
Thos. Heys & Son  
Milton Hersey Co.  
Ledoux & Co.

## Coal—

Dominion Coal Co.  
Nova Scotia Steel & Coal Co.

## Coal Cutters—

Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.

## Coal Handling Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Coal Mining Explosives—

Curtis & Harvey (Can.), Ltd.

## Coal Mining Machinery—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Jeffrey Mfg. Co.

## Coal Punchers—

Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.

## Coal Washeries—

Jeffrey Mfg. Co.  
Mussens, Ltd.  
Peacock Bros.

## Compressors—Air—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

## Concentrators and Jigs—

Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
James Ore Concentrator Co.  
Mussens, Ltd.  
Canadian Fairbanks-Morse  
Jenckes Machine Co., Ltd.

## Concrete Mixers—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.

## Condensers—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

## Converters—

Fraser & Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Mussens, Ltd.

## Conveying Machinery—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Conveyor—Trough—

Hendrick Mfg. Co.

## Cranes—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
M. Beatty & Sons, Ltd.

## Cranes—Electric—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Cranes—Overhead Traveling—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Crane Ropes—

Mussens, Ltd.  
Allan, Whyte & Co.  
Thos. & Wm. Smith  
B. Greening Wire Co., Ltd.

## Cranes—Swing Jib—

The Herbert Morris Crane & Hoist Co., Ltd.

## Cranes—Wall—

The Herbert Morris Crane & Hoist Co., Ltd.

## Crushers—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Lymans, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Hadfield's Steel Foundry Co.

## Cyanide Plants—

Jenckes Machine Co., Ltd.  
Fraser & Chalmers, Ltd.  
Roessler & Hasslacher  
Thos. & Wm. Smith  
Peacock Bros.

## Derricks—

Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

## Diamonds (for Diamond Drills)—

Abe. Levine

## Diamond Drill Contractors—

Diamond Drill Contracting Co.  
Smith & Travers.

## Dredging Machinery—

Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.

## Dredging Ropes—

Allan, Whyte & Co.  
Fraser & Chalmers, Ltd.  
B. Greening Wire Co., Ltd.

## Drills, Air and Hammer—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.

## Drills—Core—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.

## Drills—Diamond—

American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.

## Drill Steel Sharpeners—

Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Mussens, Ltd.

## Drills—Electric—

Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

## Dump Cars—

Sullivan Machinery Co.

## Conveyors—Belt—

Mussens, Ltd.  
Siemens Co. of Canada, Ltd.

## Dynamite—

Curtis & Harvey (Canada), Ltd.

## Canadian Explosives

Northern Canada Supply Co.

## Dynamoes—

Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.

## Electric Cranes—

The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

## Elevating and Conveying Machinery—

Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Ejectors—

Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

## Elevators—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Peacock Bros.

## Engineering Instruments—

C. L. Berger & Sons  
Peacock Bros.

## Engineers and Contractors—

Fraser & Chalmers, Ltd.  
Roberts & Schaefer Co.

## Engines—Automatic—

Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Gas and Gasoline—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.  
Alex. Fleck  
Sullivan Machinery Co.  
Smart-Turner Machine Co.  
Peacock Bros.  
John Inglis & Co., Ltd.  
Can. Fairbanks-Morse Co.

## Engine—Haulage—

Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.

## Engines—Marine—

Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

## Engines—Oil—

Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

## Engines—Steam—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
The John Inglis Co., Ltd.

## Fans—Ventilating—

Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.

## Feeders—Ore—

Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.

## Flights—

Hendrick Mfg. Co.

## Friction Hoists—

Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

## Forges—

Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.

## Forging—

M. Beatty & Sons  
Smart-Turner Machine Co.  
Peacock Bros.



# Canadian Explosives, Limited

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Main Western Office - VICTORIA, B.C.

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We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

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We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

## DISTRICT OFFICES:

NOVA SCOTIA:	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,	-	Kingston
MANITOBA:	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,	-	-	Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 28.)

- Furnaces—Assay—**  
Lyman, Ltd.  
Mussens, Ltd.
- Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada),  
Limited  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian H. W. Johns-Man-  
ville Co., Ltd.
- Gears—**  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.
- Generators—**  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.
- Hangers—Cable—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.
- Hand Hoists—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Beaters—Feed Water—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers, Ltd.
- High Speed Steel Twist Drills—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Hoists—Air Electric and  
Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.
- Hoists, Chain, Electric and  
Pneumatic—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Hoisting and Conveying Mach-  
inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.
- Hoisting Engines—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Sullivan Machinery Co.  
Fraser & Chalmers, Ltd.  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons
- Hoists—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.
- Hose—**  
Canadian H. W. Johns-Man-  
ville Co., Ltd.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Jacks—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Jigs—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.
- Lamps—Acetylene—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Lamps—Safety—**  
Mussens, Ltd.  
Canadian Explosives  
Peacock Bros.
- Link Belt—**  
Northern Canada Supply Co.  
Jones & Glassco
- Locomotives—Electric—**  
Mussens, Ltd.  
Jeffrey Mfg. Co.
- Locomotives—Steam—**  
Mussens, Ltd.
- Metal Merchants—**  
Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.
- Monel Metal—**  
Orford Copper Co.
- Motors—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.
- Ore Sacks—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Ore Testing Works—**  
Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell
- Ores and Metals—Buyers and  
Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pick Machines—**  
Sullivan Machinery Co.
- Picks—Steel—**  
Mussens, Ltd.  
Thos. & Wm. Smith  
Peacock Bros.
- Pipes—**  
Consolidated M. & S. Co.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.
- Pipe Fittings—**  
Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Pneumatic Chain Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco
- Producer—Gas—**  
Mussens, Ltd.
- Prospecting Mills and Machin-  
ery—**  
Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.
- Pulleys, Shaftings and Hang-  
ings—**  
Fraser & Chalmers, Ltd.  
Northern Canada Supply Co.
- Pumps—Boiler Feed—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Fraser & Chalmers, Ltd.
- Pumps—Centrifugal—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Thos. & Wm. Smith  
M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.
- Pumps—Electric—**  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.
- Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.
- Pumps—Pneumatic—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.
- Pumps—Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.
- Pumps—Turbine—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.  
The John Inglis Co., Ltd.
- Pumps—Vacuum—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Quarrying Machinery—**  
Mussens, Ltd.  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Roasting Plants—**  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers, Ltd.
- Rolls—Crushing—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Fraser & Chalmers, Ltd.  
Can. Allis-Chalmers, Ltd.
- Roofing—**  
Paterson Mfg. Co.  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville
- Rope Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.  
Mussens, Ltd.
- Rope—Manilla and Jute—**  
Jones & Glassco  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.
- Rope—Wire—**  
B. Greening Wire Co.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith  
Fraser & Chalmers, Ltd.  
Mussens, Ltd.
- Rubber—**  
Canadian Consolidated Rub-  
ber Co., Ltd.
- Runways, Hand Operated—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Samplers—**  
Canadian Laboratories  
Ledoux & Co.  
Milton Hersey Co.  
Thos. Heys & Son
- Screens—**  
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### Aggregate Value of \$430,137,522

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1892, inclusive, \$81,090,069; for five years 1893-1897, \$31,420,396; for five years 1898-1902, \$77,218,073; for five years 1903-1907, \$109,797,744; for five years 1908-1912, \$130,611,240.

### Production During last ten years, \$240,408,984

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

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Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

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**HON. E. H. ARMSTRONG,**  
Commissioner of Public Works and Mines,  
HALIFAX, N. S.

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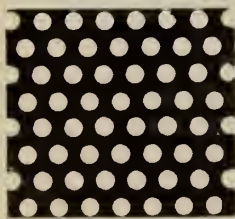
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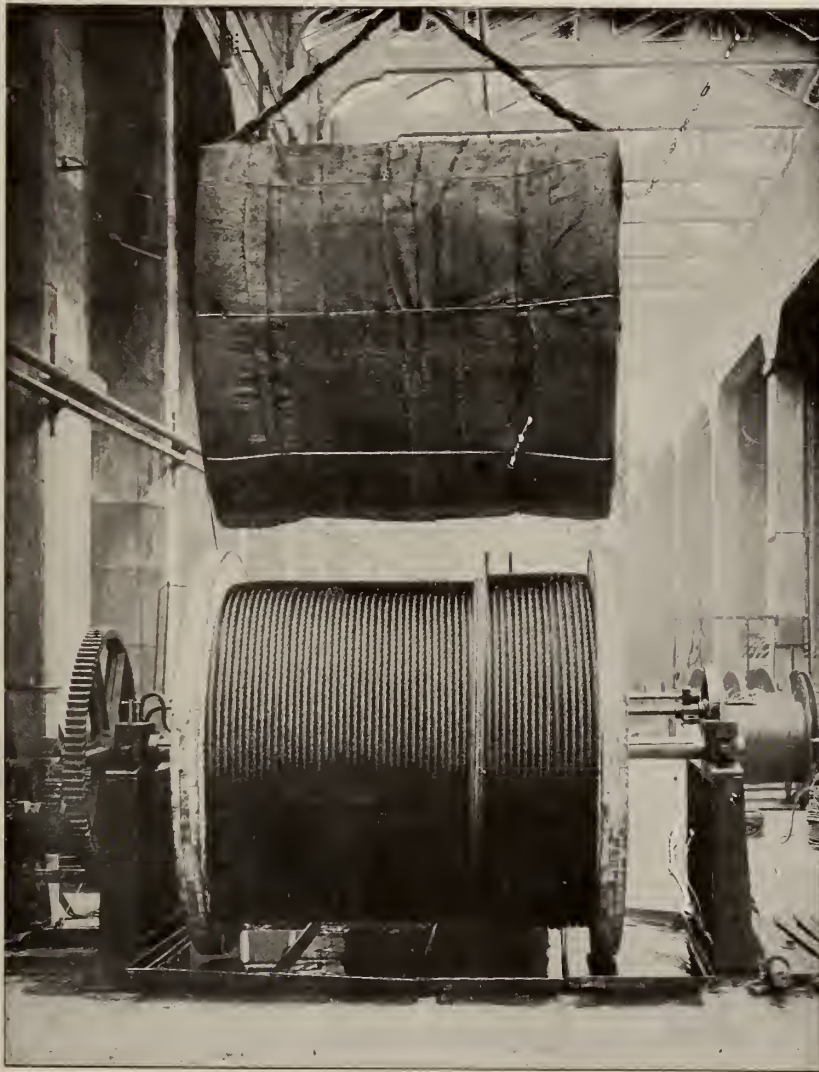
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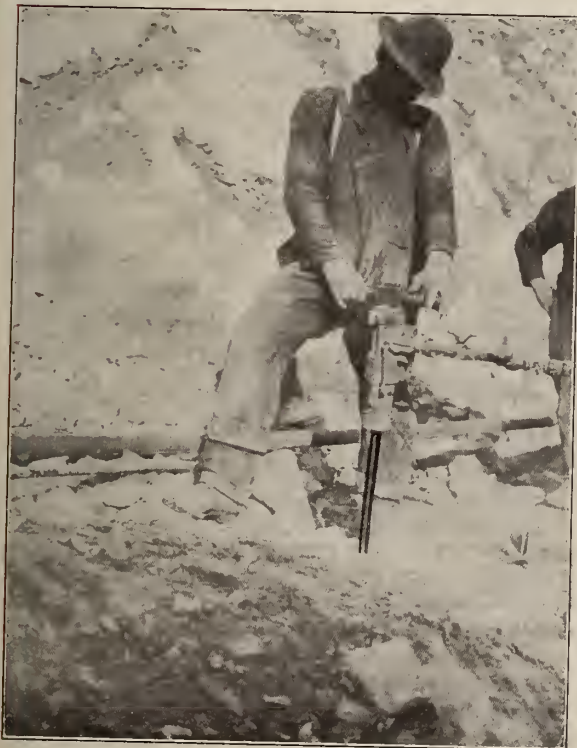
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VOL. XXXV

TORONTO

No. 22

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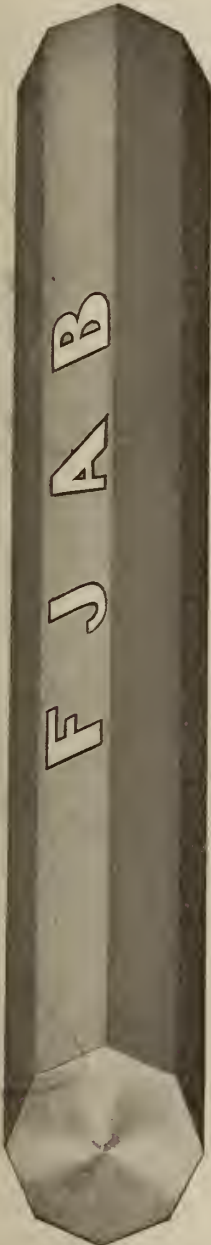
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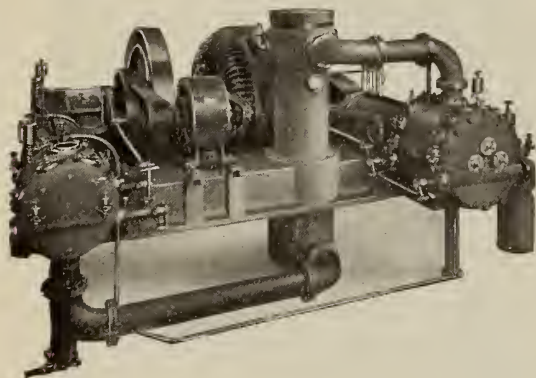
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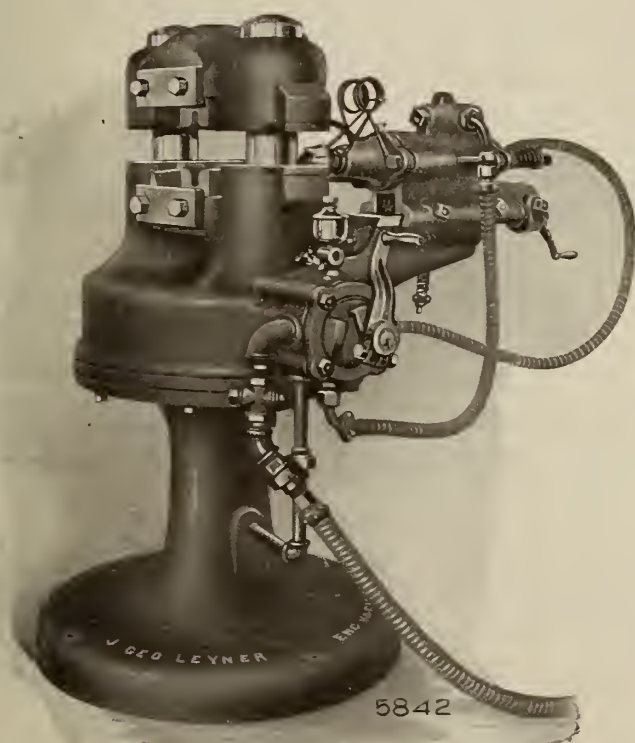
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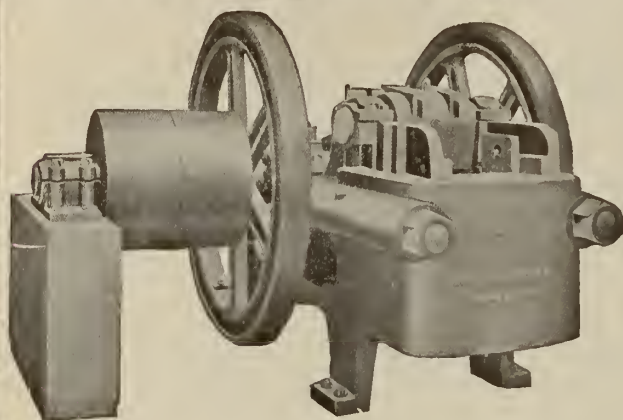
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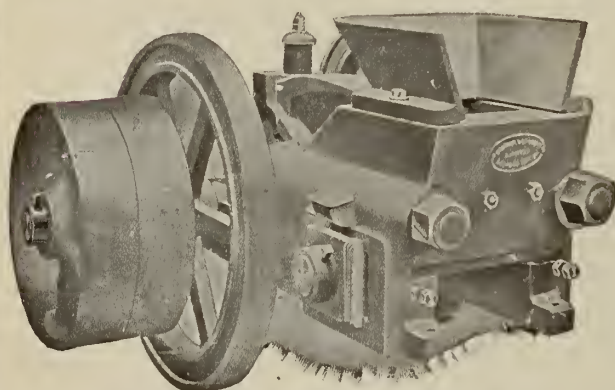
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Clean, Sound and true to pattern.

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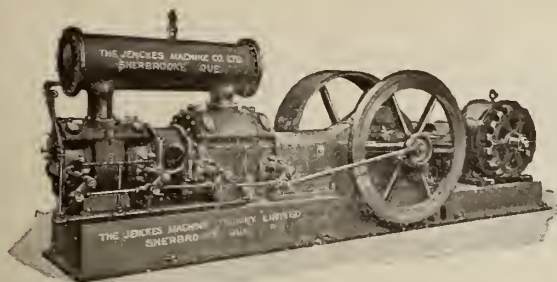
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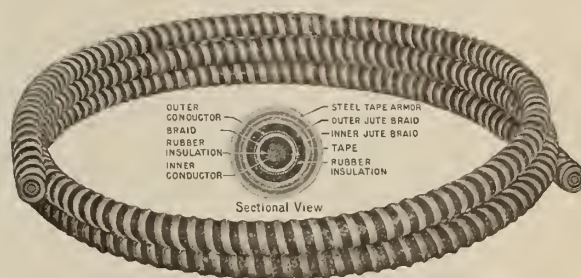
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## Synopsis of Coal Mining Regulations



**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

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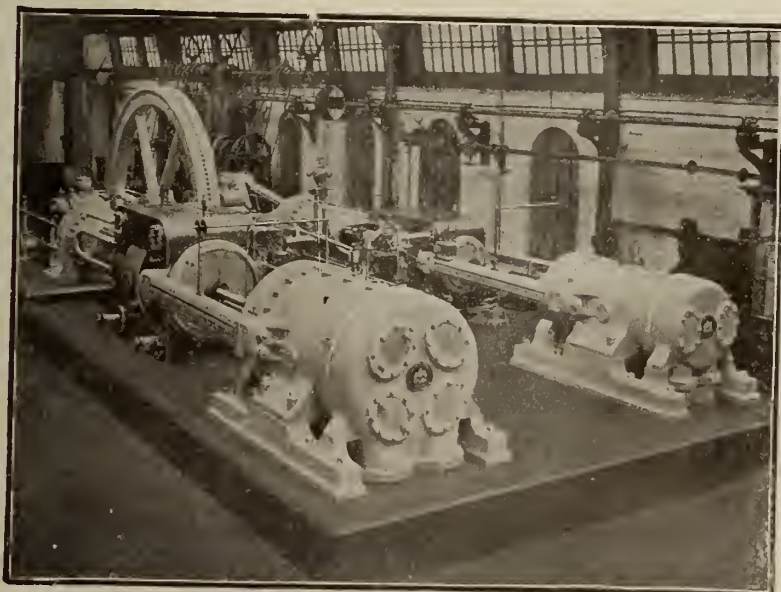
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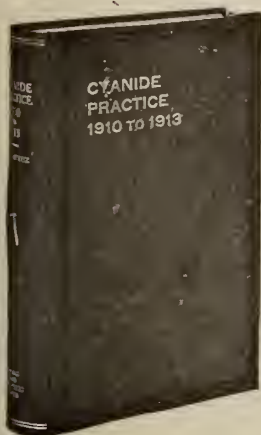
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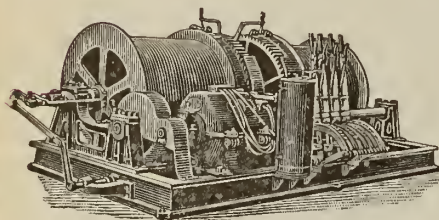
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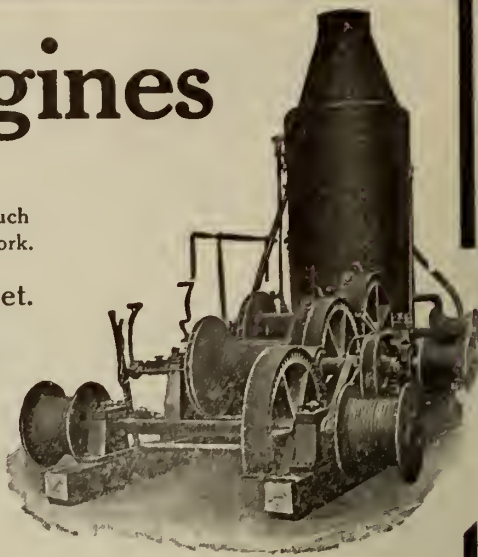
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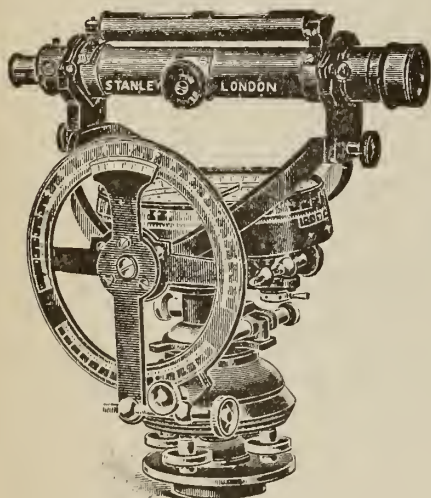
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## JUDICIAL SALE of ASSETS of The Swastika Mining Company, Limited

Tenders will be received addressed to "The Master-in-Ordinary, Osgoode Hall, Toronto," and marked "Tenders re The Swastika Mining Company, Limited," up to eleven o'clock A.M. of the 15th day of December, 1914, for the purchase of all the Assets (en bloc) of the above-named Company. A short statement of Assets is as follows:—

**Properties:** Parcels Nos. 8414, 8415, 8416, 8410, 8412 in the Register for Nipissing for which patents have been issued, and Parcels 16358 and 16359 in the Temiskaming Mining Division and 12619 Larder Lake Mining Division, upon which last three all assessment work is said to have been performed, but for which Patents have not yet been obtained, and Mining Rights in claims 16418 and 16419 Larder Lake Mining Division Subject to completion of assessment work

The Company's expenditures in developing, prospecting, etc., are shown by the books of the Company to amount to \$130,964.85.

**Buildings:** These are said to consist of Office and Store Room, Oil House, Engine Room, Shaft House, Mill, Cook House and Sleeping Camp, Ice House, Assay Office, Pump House, Stable, four Dwelling Houses and two Log Shacks. The cost of construction of buildings, including main shaft construction, etc., is shown by the books of the Company at \$48,953.96.

**Mine Machinery, Equipment and Supplies:** This includes the Mill Equipment, Pipe and Water Line, 1 Sullivan 9 drill Compressor, 1 Jenckes Hoist, 2 125-h.p. Jenckes Boilers and 1 Chalmers & Williams No. 12A. Mortar with five stamps complete—book value \$51,689.65.

Inventories may be examined at the Office of the Liquidator to whom application should be made for inspection of the assets.

The properties of the Company upon which operations were carried on immediately adjoin the Town of Swastika which is on the Main Line of the Temiskaming and Northern Ontario Railway, a little north of Englehart.

**Terms of Sale:** Twenty-five per cent. in cash and the balance secured to the satisfaction of the Liquidator.

A marked cheque, payable to the Liquidator for ten per cent. of the amount of the tender must accompany each tender which will be returned if the tender is not accepted.

The tenders will be opened by the Master-in-Ordinary at his Chambers, Osgoode Hall, Toronto, on the 15th day of December next, at the hour of eleven o'clock A.M. All who tender are requested to be present.

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The other conditions of the sale are the standing conditions of Sale of the Court as far as applicable.

For further particulars apply to the Liquidator or its Solicitors.

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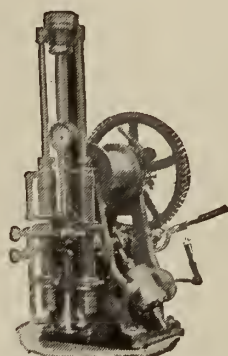
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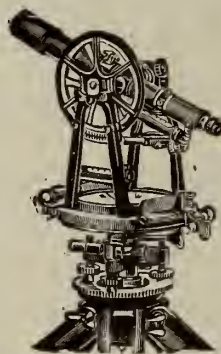
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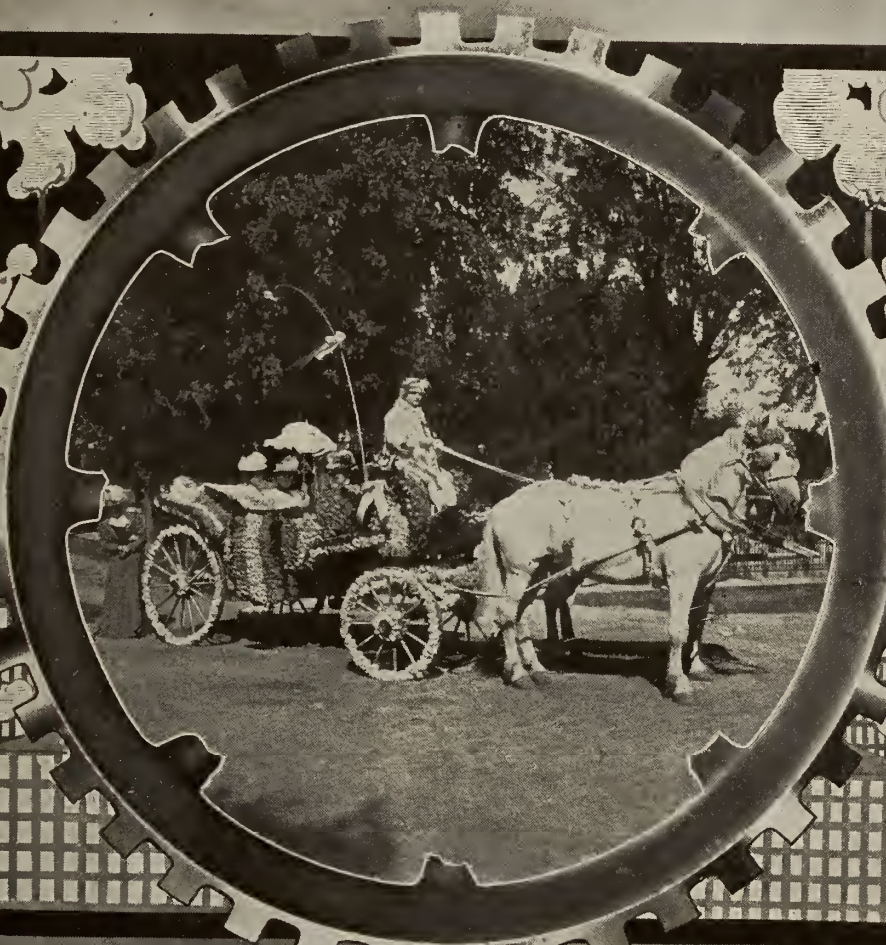
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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, November 15, 1914.

No. 22

## The Canadian Mining Journal

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Devoted to Mining, Metallurgy and Allied Industries in Canada.

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**MINES PUBLISHING CO., LIMITED**

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Editor

**REGINALD E. HORE**

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### CIRCULATION.

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## ONTARIO MINES IN 1913

The report of the Ontario Bureau of Mines for the year 1913 has just been published. This report contains detailed information concerning operations during the year. Preliminary reports were issued in March; but the complete report has been, as usual, a long time in the press. What it lacks in up-to-dateness, however, is compensated by the character of the contents.

The statistical review by Mr. T. W. Gibson, Deputy Minister of Mines, is like all of Mr. Gibson's reports, full of useful information carefully presented. A concise summary of statistics of mining in Ontario during the year is always to be found in the Bureau of Mines reports and to Mr. Gibson belongs most of the credit. Mining men sincerely regret that such a splendid official is this year suffering greatly from ill-health.

The report shows that the mineral production of the Province during 1913 had a value of \$53,232,311. The greater part of this total is contributed by the Sudbury nickel-copper mines, Cobalt silver mines, and the Porcupine gold mines. But many other mines and quarries contribute large amounts. That Ontario's mineral industry has become of such great magnitude is especially fortunate this year when the importance of productive industries is being impressed on everyone.

Mr. Gibson in his introductory paragraphs points out some of the ways in which the mining industry develops the country. He says:

"Diversity of occupation exercises a favorable influence upon the development of a new country. No one industry, of course, is self-sufficient, and, in these days of increasing specialization, every industry tends to become more dependent upon and more necessary to all the others. Naturally, the industries which first take root in a given area are those for which its resources are most evidently adapted. In a wooded country, such as northern Ontario, the first in order of time is lumbering. Where the land is good and railway access is afforded, agriculture comes at once upon its heels, closely followed, where there are workable minerals, by mining. Soon all three industries are found in various stages of development, each playing an important part in the settlement of the country. Felling the trees and hauling the logs give employment to the settler during the winter months and help him to earn some ready money. Lumberjacks and miners alike must be fed, and so there is a home market for all the farm produce which the settlers can raise beyond their own requirements. The settler is himself a lumberer so far as his own farm is concerned, and brings sawlogs, pulpwood, railway ties

and fence posts to market. Buildings must be put up at farm and mine, and for these lumber is necessary.

"Most of the lumberman's cut of sawlogs or the output of his sawmill is transported elsewhere to find a market, and this is the case also with the silver, gold, copper or nickel won from the mine. But in the production and handling of these commodities much labor and capital are called into use. Communities are formed, and industrial and social development goes on. Water powers, so numerous in northern Ontario, are compelled to furnish power, light and traction. Pulp and paper mills are erected to make use of the abundant supplies of spruce and poplar. Roads and railways are built. Schools, churches, hospitals, and other institutions with improvement and amelioration as their end, come into being. So too, unfortunately, do jails and 'blind pigs,' for crime and excess accompany the human animal whether he is found in forest or mine or the crowded town."

The 1913 production was valued at \$4,890,699 greater than that of the previous year, when the total was \$48,341,612. There has been an increase of 112 per cent., compared with five years ago.

Part 1 of the report, in addition to the statistical review of the mineral industry, contains descriptions of the mines of Ontario by Mr. T. F. Sutherland, Chief Inspector of Mines. A paper by Dr. A. P. Coleman describes the structural and age relations of the pre-Cambrian rocks north of Lake Huron, which are of great interest from both the scientific and economic points of view. Mr. G. R. Mickle, Mine Assessor, in co-operation with Professors W. H. Ellis, J. W. Bain and E. G. R. Ardagh, contributes an important paper on The Chemical Composition of Natural Gas Found in Ontario. This paper adds many interesting facts to our knowledge of this valuable substance.

Mr. T. F. Sutherland's report on Mining Accidents gives an account of the accidents and an analysis of fatalities. Numerous suggestions are given for prevention.

Dr. Coleman's paper on the pre-Cambrian rocks north of Lake Huron is presented after many years' study of the district, and is an important contribution to our knowledge of the formations which yield a very large part of the minerals produced in Canada.

The paper on Chemical Composition of Natural Gas in Ontario will be read with much interest. The literature contains scant information on this product of the Province. Natural gas is used in large quantities for household purposes and its composition is obviously a matter of great importance.

Part 2 of the report contains a description of the Kirkland Lake and Swastika gold areas, by Messrs. A. G. Burrows and P. E. Hopkins. This report was published some months ago as a separate bulletin and extracts from it have appeared in the Journal.

## FOREIGN LABOR IN THE MINES

We have drawn attention in these columns to the large number of foreigners among the miners in Canada and the United States. A very large proportion of the underground force at nearly every mine is made up of men who are not natives and most of whom have been but a few years in the country. Many of our best miners are of this class. They do their work well and provided they are law abiding they are welcome. Unfortunately their lack of acquaintance with our laws and customs, and their unfamiliarity with the language are frequently the causes of regret to employers and employees alike. The miner who cannot understand the orders he receives from his captain is at a grave disadvantage and often the source of trouble for his companions. The tendency to pretend understanding while in fact quite ignorant of the captain's orders is often the cause of accidents.

Mr. T. W. Gibson in his recently issued report says of these men:

"A large proportion of the labor in mine and lumber shanty, and in railway and wagon road-making, is of the unskilled type, where muscle counts for more than mind. Very much of this is supplied by immigrants from foreign lands—chiefly those of continental Europe—and hence a surprisingly large share of the industrial population of the north is composed of Finns, Poles, Austrians, Italians, Bulgarians, etc. There are also Syrians in considerable numbers, and Greeks, but they are usually in trade, and are rarely found engaged in manual labor. Whether or not the presence of large numbers of non-English-speaking laborers is wholly desirable, this is perhaps not the place to discuss, but the fact is they are there, and in response to a demand. Mine managers and railway contractors assert, and no doubt with truth, that they could not operate their mines or build their embankments were it not for this foreign labor. Anyone looking over the list of mining accidents, compiled by Mr. T. F. Sutherland, Chief Inspector of Mines, cannot but be struck with the large percentage of names of foreign origin. Doubtless there is a connection between this fact and the comparatively high death and accident rate in the mines of the Province. In part this may be due to unfamiliarity with the English language and the difficulty of comprehending quickly spoken orders in an emergency. Mental traits have also to be reckoned with, and the fact that very few of these men were miners before coming to this country, or at any rate to this continent. Ignorance of the risks in mining and the handling of explosives, a certain lack of resourcefulness in the presence of danger, amounting almost to inertia or even stupidity, and other characteristics, contribute to the same result. The building up of a strong force of capable and experienced miners such as the mining industry of Ontario now imperatively requires, will be a slow process, but when accomplished it will mean very much for the effective and economical operation of our mines."



## INTERNATIONAL GEOLOGICAL CONGRESS

The twelfth session of the International Geological Congress held in Canada in August, 1913, was undoubtedly one of the most important events of the year, bringing together as it did a host of learned men from all parts of the world.

At the meeting many papers were read and there were several spirited discussions. But the papers were given little attention compared with the excursions to all parts of the Dominion which were arranged and carried out so admirably.

The volume of transactions has now been distributed. It is a large volume of 1,034 pages with several illustrations and contains an account of the organization of the Congress, the work of preparation for the meeting, the entertainment of members, the meeting, the excursions, and reports of the officers.

Mr. R. W. Brock, general secretary and treasurer, in his report shows that owing to the liberality of the Dominion and Provincial Governments, the Canadian Northern railway, the Coniagas, Mond, Canadian Copper, Hollinger, Canadian Collieries, Le Roi No. 2, Union Natural Gas, Seneca Superior, Provincial Natural Gas, and Cobalt Lake companies, the Congress was a financial success.

Mr. Brock mentions particularly the services rendered by Dr. F. D. Adams, G. G. S. Lindsey and Stanley Leckie. To these gentlemen belongs a large share of the credit for the grand success of the Congress. To these names should, however, be added that of Mr. Brock and a host of others who contributed their services.

Several of the papers of most interest to mining men appearing in the Transactions have already been published in this Journal. In this issue will be found Dr. Leith's paper which brought out one of the most lively discussions at the meeting. Some of the contributed remarks will be found in our next issue.

### BETHLEHEM STEEL CORPORATION.

If one were asked to name the individual U. S. steel corporation which will make the best showing in 1914, a year of the greatest prostration in steel in a decade, the answer to be correct would have to be Bethlehem Steel.

This company up to the first of October was operating at 70 per cent. of capacity, and it is understood that even with the slump of the last month has not gone greatly below that figure. In fact, foreign supply orders in sight or actually booked make it probable that this 70 per cent. ratio can be maintained during the balance of 1914.

An official of Bethlehem Steel is authority for the statement that the company will this year earn 5 per cent. dividend on the \$14,908,000 preferred more than five times over. Or, stated in terms of the \$14,862,000 common, Bethlehem Steel should this year earn between 15 and 20 per cent. against 34 per cent. in 1913 and 13.8 per cent. in 1912, or the second best record the company has ever made.

Of course Bethlehem Steel has had the immense advantage during 1914 of coming into the year with nearly \$25,000,000 of unfilled orders on its books.

Bethlehem Steel is reaping the benefit of its policy of consistent development out of earnings. During the period from 1909 to Dec. 31 next the company will have earned nearly \$40,000,000 net, during which only about \$3,000,000 has been returned to shareholders. The balance has been reinvested in plant and working capital and goes a long way in explaining why the company is a low cost producer and why it can make hay when the clouds are hanging leaden over the great bulk of steel manufacturers.

There has been a good deal of talk about the benefit which the war has conferred upon Bethlehem Steel because of its ordnance and armor plate departments and its special departments for production of Government munitions. This is more of a theory than a reality to date, however. In fact, the war has so far hit its ordnance department harder than any other. It is only fair to state, however, that the company is in line for some big foreign gun and armor plate work if present conditions hold. If there is any man in the world who knows how to sell steel products, it is Charles M. Schwab and his standing in the councils of the warring Governments at present is second to none. Mr. Schwab is now in England.

### KITCHENER.

T. P. O'Connor writes in part in Collier's Weekly:

The silent Sphinx; the emotionless machine; the harsh and heartless commander; all these picturesque phrases applied to Lord Kitchener are absolutely misleading.

When met at a dinner party he is eager to talk, and talks admirably, with a certain directness and terseness, but not without imagination, and with great insight. In the intimacy of his own room at night and with only a friend or two, he can talk the whole evening through; and nobody thinks of interrupting the stream of interesting reminiscence and shrewd comment.

The emotionless machine has plenty of emotion, though well under restraint; is considerate to subordinates—scarcely says a harsh word—never utters a harsh comment behind anybody's back, and often has distinguished himself from more excited subordinates, not by the rigor, but by the greater humanity, of his judgment and action. This man without emotion has, in reality, a keen and abiding sympathy with those eastern people among whom his life has been mainly spent. He speaks their language, understands their nature.

This man, who has fought such tremendous battles, prefers a deal to a struggle; and, though he can be so stern, has yet a diplomatic tact that gets him and his country out of difficult hours.

One of his greatest qualities is his accessibility. Anybody who has anything to say can approach him; anybody who has anything to teach him will find a ready and grateful learner. This is one of the secrets of his extraordinary success and universal popularity in Egypt. Lord Kitchener was the cadi under the tree. A student Lord Kitchener began; a student he will remain to the end of his days.

There is yet another mistake about Kitchener: that grimness supposed to mean absence of all humor. His



sense of humor is never absent; he sees the humorous side of everything—even in the most serious situations. It has carried him through; without it he would have found his career and his life impossible.

The roots of Kitchener's greatness lie in intense ambition to succeed—above all, to the incessant desire to work and fill every hour with something done. He is sent as a youngster to Palestine; through peril to life, through great privation, he pursues his work until he has completed a map of all western Palestine. He learns Arabic, and, above all, the Arabic character. Kitchener found his coronet in the Arab grammar.

Choice of subordinates is one of Lord Kitchener's greatest powers. He nearly always has had the right man in the right place. And his men return his confidence because he gives them absolute confidence. This is one of the reasons why, though he works so terrifically, he never is tired, never worried.

A great soldier, but perhaps a greater organizer than anything else. This is his supreme quality, and for that quality there is necessary above all things a clear, penetrating brain. At school he was celebrated for his knowledge of mathematics. A mathematician, an engineer, a man of science, a great accountant—these things he has been in all his enterprises.

#### COAL MINE EXPLOSIONS CAUSED BY GAS OR DUST.

In a paper prepared for the October meeting of the American Institute of Mining Engineers, Mr. Howard N. Eavenson presents carefully tabulated statements concerning explosions in the coal mines of the United States, Canada and Mexico.

From the data gathered Mr. Eavenson concludes:

1. In North America, minor explosions, or those in which less than five fatalities occurred, happen most frequently in October, November, December, January and March, although nearly as many have happened in June as in March; those in December, January and February are above the average in fatalities, as are also those in May and July, those occurring in May having a slightly greater average fatality than even those of December.

Serious explosions, or those in which more than five lives have been lost, have happened most frequently in January, February, March, April and November. Contrary to the usual belief, the number of explosions in December has been slightly below the average, although their intensity, and the number of lives lost, have been considerably greater than those of any other month. January, February and May are also above the average in the number of fatalities per explosion, May being next to December in this respect.

For all explosions of gas or dust, January, March, November, October and December, in the order named, are above the average in number of explosions; in number of fatalities per explosion, May, December, February, January and March are above the average. For all explosions, therefore, May exceeds any of the winter months of fatalities per explosion.

2. In the coal mines of the United States, the total number of accidents and of fatalities due to explosions of gas or dust has been steadily increasing; there has been a slight increase in the number of accidents and a more decided increase in the number of fatalities per million tons produced; the serious explosions, causing five or more fatalities each, have been steadily increasing in actual number and number of fatalities, as well as in number of accidents and of fatalities per million tons produced; the number of accidents per mine, both serious and total, also shows a steady increase. It is

therefore true that we have more explosions, and more serious ones, both actually and in relation to our number of mines and production, than we had years ago.

3. In the coal mines of Great Britain, minor explosions, so far as our records show, have occurred most frequently in the months of August, October, May, March and September, while those in April, May, August, November, March and July are above the average in number of fatalities per explosion. Serious explosions have occurred most frequently in December, October, November and March, while those in June, December, July, February and May have been of more than average intensity. For all explosions, August, October, December, March, May and November are above the average in number, and December, June, July, February, are above the average in intensity. By far the largest number of fatalities has occurred in December, June being second in this respect.

4. In the coal mines of France, from 1841 to 1904, minor explosions have occurred most frequently in July, August, February, April, May and January and have been of more than average intensity in April, December, July, February, August and October. Serious explosions have been above the average in frequency in August, April, July and March, and in intensity in January, September, December, July, November and October. For all explosions, July, August, April and May are above the average in number, and December, January, November, July, March, October and September in intensity. By far the largest number of both accidents and fatalities have occurred in July.

5. In the coal mines in Belgium, 1891 to 1909, minor explosions occurred more frequently than the average in June, May and July, and in March, January, February, April and June were of more than average intensity. Serious explosions occurred most frequently in May, March and July and were of more than average intensity in March. For all explosions, May, July and June are above the average in number and March in intensity. By far the largest number of fatalities occurred in March.

#### AMERICAN MINING CONGRESS.

The seventeenth annual session of the American Mining Congress will be held at Phoenix, Ariz., Dec. 7, 8, 9, 10 and 11, 1914.

The same plan will be followed as that of last year; namely, all the leading papers will be printed and distributed in advance of the convention. This plan gives better opportunity for direct discussion of the papers presented and facilitates reaching intelligent conclusions. The printed pages will be distributed to members and the author given ten minutes to make any desirable supplementary statement. Two or three speakers will be asked to make ten-minute addresses and then the discussion will be open to all delegates.

Among the subjects which will be discussed are the following: Western Mining Conditions, Mine Manufacturing, Federal Investments, Safety, Federal Aid in Mining, Federal Aid to Mining Schools, Water Power Development, Conservation, Workmen's Compensation, Development of Minerals in Reservations, Right-of-Way on the Public Domain, Mine Taxation, Revision of Mining Laws and Compulsory Arbitration.

While the entertainment features will be so planned as not to interfere with the work of the convention, more time than usual will be allowed from the regular sessions. The local entertainment committee will be ready to make enjoyable every minute not occupied by the business of the Congress. President, Carl Scholz; Secretary, J. F. Callbreath.



## RECLAIMING CALUMET AND HECLA TAILINGS WITH A HYDRAULIC DREDGE

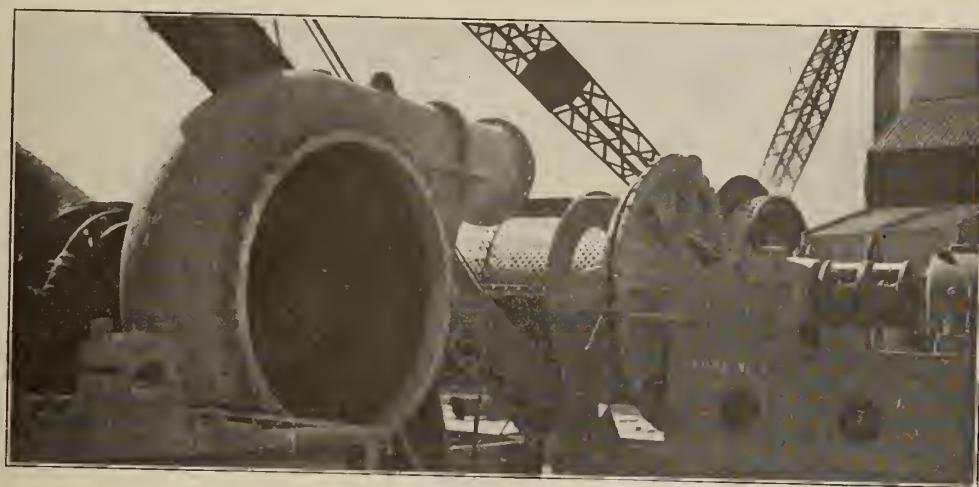
For nearly forty years, the Calumet and Hecla Copper Mining Company has deposited in Torch Lake at Lake Linden, Houghton County, Michigan, an immense amount of sand, the residue from the rock crushed in the stamp mills. In the early days sand containing fully one per cent. copper was thus disposed of. During the past few years the loss in tailings has been much reduced, but only recently has a process been perfected whereby the tailings now in the lake can be reworked and the copper recovered. It is estimated that the amount to be recovered on the shores and in the lake aggregates 40,000,000 tons.

In order to accomplish this, the Calumet & Hecla Company have under construction a hydraulic dredge

problem mentioned before. No. 1 pump is driven by a 750 h.p. motor, and No. 2 by one of 1,250 h.p.

Pump No. 1 delivers the material directly from the lake to the screen on the dredge. When this screen is disconnected, by changing the pipe connections, it pumps ashore through a pipe line up to 800 ft. in length, with a maximum elevation of about 30 ft.

Pump No. 2 pumps ashore from the sump under the screen through a pipe 2,500 to 3,000 ft. in length, with a maximum elevation of about 10 ft. This pump is so designed that it may be connected to the suction pipe and thus take the material directly from the bottom of the lake to shore, in place of No. 1. Either pump may be used independently when the screen is not in



Centrifugal Pump, Dredge No. 1. Calumet and Hecla Mining Co.

which is designed to dig to a depth of 100 feet below the surface of the lake, a greater depth than has ever been attempted by a hydraulic dredge before. In fact, the maximum depth dredged in this manner at the present time is attained by the sand suckers in Long Island Sound, a depth of 70 ft. The dredge was designed and built by the Bucyrus Co.

The problem encountered as far as it affects the dredge design is somewhat complex. Certain portions of the tailings piles have in the past been used as a public dump, consequently, a certain percentage of foreign matter is contained therein. It becomes necessary, therefore, to screen the material thoroughly before delivery. As, however, only a portion of it requires screening, the design of the dredge must be such that the screen may be cut out when not required. This has led to the necessity of two pumps, and a complicated control.

The dredge has a steel hull, 110 ft. long, 56 ft. wide and 9 ft. deep. The deck, however, has an 8 ft. overhang, which makes the extreme width of the hull 72 ft. The digging ladder is 136 ft. in length, requiring a ladder well 70 ft. long by 10 ft. wide. This extreme length of well has necessitated an exceedingly heavy overhead truss.

There are two centrifugal dredging pumps, each of 20 in. diameter, which for convenience will hereafter be referred to as No. 1 and No. 2. Two pumps instead of the usual one are made necessary by the screening

use. The decision as to which pump should be used depends upon the length of the pipe line at the time. It is impossible of course to make one pump suffice, as the screen when in use breaks the flow.

The screen is 7 ft. in diameter and about 45 ft. long. It is made of manganese plates with perforations one inch in diameter. It delivers the refuse to a scow alongside.

No cutterhead is required because of the loose character of the material, which has no binder. Hydraulic jets are provided, however, with which to break up the material if necessary. These jets are operated by an 8-in., two-stage horizontal double suction turbine pump, driven by an independent motor.

On account of the great depth of the lake and the soft nature of the material, the dredge works on head and side lines instead of spuds.

Instead of one winch, as is the custom of dredges of this type, the length of the ladder well makes it necessary to have two. Each has four drums, for the ladder hoist, two bow swing lines, two ladder swing lines, two stern swing lines, and a tail line. Each winch is driven by an independent 50 h.p. motor.

An air compressor is provided for operating the air cylinders which control the friction clutches. A 6-in. service pump of the same type as the jet pump is supplied for sealing the swivel joints in the suction pipe in order to prevent air leaks. There is also an overhead crane for serving the machinery.



As the dredge is to be worked the year round, a 75 h.p. boiler is provided for heating purposes and for driving the capstans and electric light plant when the dredge is being shifted and no electric power is available.

The two-pump feature has necessitated a number of unusual features of control. The pumps, in the first place must be balanced, so that No. 1 will not deliver more material than No. 2 can take care of. This is possible as No. 1 is working under a constant load, while the load No. 2 carries varies according to the length of the discharge pipe which is in use. This necessitates a careful adjusting of the speeds of the pumps. After thorough study a water rheostat was adopted, the first time that this has ever been tried in the United States for large motors. This device gives an infinite number of speed control points and thus great flexibility. The speed is governed by the height of the liquid in the rheostat tanks, and the flow by a pivoted over-

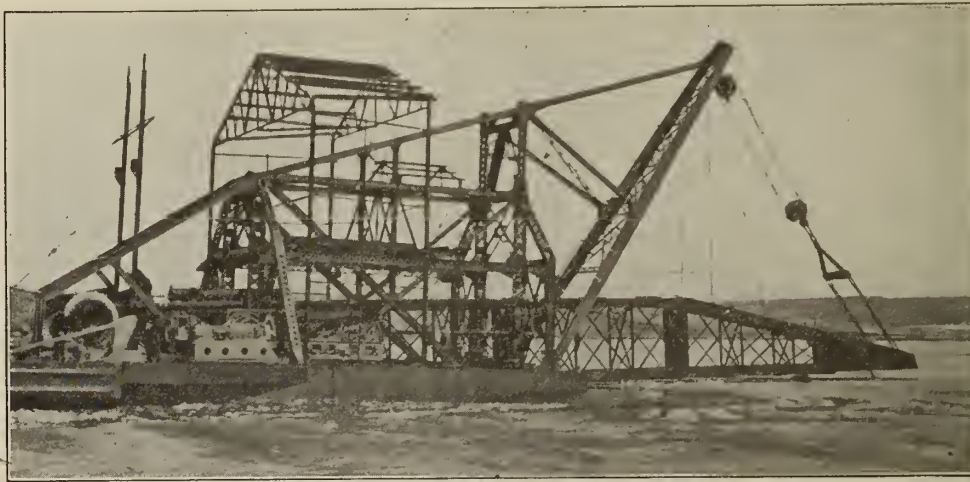
The end of the ore reserves at No. 1 mine in Cobalt was reached in June of this year, and the following months the mine was closed down, after a production for the fiscal year to that date of 393,360 oz. of silver, which had a value of \$196,435.92.

Speaking of the Porcupine camp, the President stated that the purchase of the Dome Lake Mining Company stock was considered a very important one by the directors, and although requiring a large investment of cash surplus, the results to date in development work justified the action of the directors.

The company now holds 540,000 shares of the stock. The total issue is 940,312 shares.

An option is now held by the company on the remaining shares in the treasury of the Dome Lake.

During the past year several mining claims had been examined, but none were taken up. On some claims at one time under option to the company in the Kirkland Lake section, assessment work was done, but the



Dredge No. 1. Calumet and Hecla Mining Co.

flow pipe, which is full on when in a vertical position and off when horizontal. The operator controls the position of the pipe. The liquid must be kept in circulation because of the danger of heating. It is pumped through cooling coils, and returned to a storage tank overhead, from which it flows by gravity into the rheostat tanks. The flow is controlled by a valve with an automatic solenoid control. A 3-in. centrifugal pump driven by an independent motor does the pumping.

Another interesting feature is the interlocking electrical control, in order to prevent starting and stopping the pumps in the wrong order.

The electric power used is 2,100 volts, 25 cycle, 3 phase. The dredge is about to be tested at the present time, but doubtless will not be operated to full capacity until next spring.

#### HUDSON BAY MINING CO.

The annual report of the Hudson Bay Mining Co. shows a total production of 391,360 oz. of silver valued at \$196,435.92 from the Cobalt property, now worked out and closed down.

The total income for the year was \$198,082.50, while the expenditure was \$145,521.79, leaving a balance of \$52,560.71.

During the past year there was spent at the Dome Lake Mine in Porcupine, the controlling interest of which is now held by the Hudson Bay, a total of \$119,375.

option was ultimately dropped.

Mr. A. H. Brown, general manager of the company, in his report to the directors, spoke in hopeful terms of both the Cobalt and Porcupine properties.

In Cobalt work is being continued at No. 2 camp, near the McKinley-Darragh, and while no favorable developments have been met with to date, there is every possibility that the thorough exploration work being carried on will result in values being proven.

At Porcupine the outlook is promising for additional ore shoots on No. 1 and 3 veins of the Dome Lake mines.

The annual report shows a total production since 1907 at the Cobalt property closed down in July last, of 5,604,168 oz. of silver. The total value of this production was \$2,965,523.18, of which the greater portion has been returned to the shareholders in dividends. These dividends amounted to several hundred dollars a share.

The action of the directors in purchasing control of the Dome Lake Mines was endorsed by action, and a resolution was passed advancing further money for development purposes at that property if necessary.

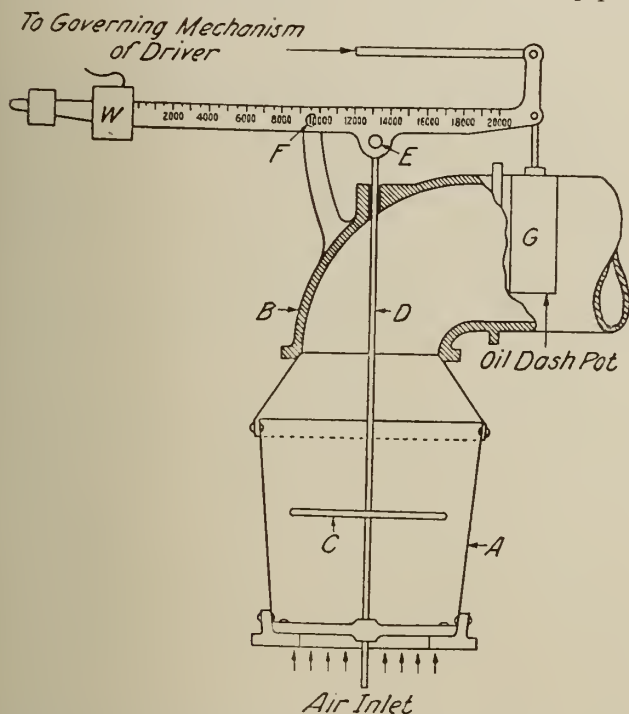
The old Board of Directors were elected, and at a subsequent meeting of the directors the same officers were again elected to the offices.

The Officers of the company are as follows: President, George Taylor; Vice-President, A. A. McKelvie; directors, Thomas McCamus, D. M. Ferguson, J. J. Grills and S. S. Ritchie, all of New Liskeard, and Charles L. Sherrill, of Buffalo, N. Y.



### A CONSTANT VOLUME GENERATOR.

The Canadian General Electric Co. has developed a constant volume governor which can be attached to their centrifugal compressors for blast furnace work. Its principle can be understood from the diagrammatic arrangement shown in the accompanying figure. The governor is placed on the intake end of the compressor, the air being admitted through a conical pipe (a) into an elbow (b), which is direct connected to the inlet flange of the compressor. In this conical pipe is



mounted a horizontal float (c) suspended from a vertical rod (d). The latter is connected to a beam (e) which is free to move about a pin support (f). The beam is graduated to indicate the amount of air in cubic feet per minute that the compressor will deliver when the sliding weight (w) is placed at any particular graduation. An oil dashpot (g) is attached to one end of the beam to dampen any too violent oscillations. The method of operation of this governor when furnishing air to the blast furnace is as follows:

Suppose that 25,000 cu. ft. of air is to be delivered to the blast furnace: The sliding weight (w) is set at the graduation mark 25,000 cu. ft., and the float (c) will assume a definite position with relation to the conical pipe (a). Let us assume that this 25,000 cu. ft. of air is being delivered against a pressure of 15 lb. per sq. in., that is, with the driver of the centrifugal compressor running at such a speed as to produce an air pressure of 15 lb. If, at any instant, the charge in the furnace becomes more densely packed, or if the furnace is slowly beginning to get into an unhealthy condition through the formation of slag, the resistance to the flow of air through the furnace is increased. With this increased resistance the centrifugal compressor can no longer deliver 25,000 cu. ft. of air, because it would take a higher pressure than 15 lb. per sq. in. to force this quantity through the furnace, and we may say that momentarily a less quantity is delivered. Just as soon as this occurs, however, the float (c) can no longer remain in its present position, because it is not sustained by the original volume of air passing by it. As the volume of air decreases the float (c) will start to drop, whereupon the rod (d) will immediately move

the beam (e) into a new position. The end of the beam arm is connected with the governing mechanism of the driver by means of suitable levers. In the case of a steam turbine drive it will admit more steam to the turbine and speed it up. This higher speed will increase the pressure delivered by the compressor until the pressure is of sufficient magnitude to force through the original quantity of air, 25,000 cu. ft. per minute. As the turbine speeds up the pressure continues to increase slowly, and therefore also the volume of air, until the constant volume governor has almost returned to its original position. The governor will then keep the turbine running at the increased speed necessary to deliver the volume of air required. The constant volume governor therefore immediately responds to any change of condition in the blast furnace, and the compressor unit will speed up or down, depending upon whether a greater or less pressure is required to force through a constant volume of air. From this it can be seen that the constant volume governor responds instantly, long before the furnace operator could notice any change, and therefore the furnace is kept in a more uniform condition. This results in a larger output of pig iron of a more constant and better quality.

### KIRKLAND LAKE.

A prospecting plant has been installed on the property of Harry Oakes, Kirkland Lake, and sinking begun on a vein that has long been recognized as one of the most promising in the district. On Oct. 15 the shaft had reached a depth of 50 ft., revealing a vein about 2 ft. in width, heavily charged with molybdenite and sulphides, and carrying free gold and telluride. The telluride, to all appearances, is identical with that found at the Tough-Oakes mine. The presence of molybdenite and finely disseminated sulphides point to a vein of like origin. As a result of prospecting during the summer two other parallel veins have been discovered, which, though carrying low values, give evidence of enrichment in sections. Mr. Oakes owns the greater part of Kirkland lake, under which he proposes doing considerable work.—J. W. M.

### McINTYRE.

The Nipissing Mining Company, of Cobalt, has officially announced the release by the company of an option held on the McIntyre mines of Poreupine. The company took up an option of 1,500,000 shares on the McIntyre some time ago, at a price said to approximate 40 cents a share, and the transaction involved cash payments of \$600,000 extending over a period of months. No reasons were given by the Nipissing Company for the release of the option.

### DOMES.

It is understood that the Dome Mines has let a contract for 30,000 feet of diamond drilling. Ten diamond drills will be started up immediately, and will be working all this winter. The work is being undertaken with a view of getting more precise information as to the extension of ore bodies between the "golden sidewalk" and the Dome Extension boundaries.

### FOLEY-O'BRIEN.

It is understood that the Foley-O'Brien gold mine at Poreupine may be opened up again soon. Operations here ceased some time in the summer when the plant was burned down. It is understood that both shafts may be operated.



## CONCENTRATION IN CONNECTION WITH CYANIDE TREATMENT OF LOW GRADE ORES

In the November bulletin of the American Institute of Mining Engineers, Thomas Crowe and G. H. Clevenger discuss this subject. Mr. Crowe says:

"The interest manifested of late in the treatment of low grade ores, together with Mr. Clevenger's discussion of the mill and metallurgical practice of the Nipissing Mining Co., prompts me to add a few remarks to concentration in connection with cyanide treatment of low grade ores. Mr. Clevenger in this discussion does not condemn concentration in this connection, but, nevertheless, the tone of his remarks would lead one to believe that his conclusions are like those of many others; that concentration is often turned to as a last resort in an attempt to improve or obtain an extraction upon an ore by the recovery and sale of the refractory portion of the ore. This, I will attempt to point out, is not always the case. Concentration in connection with cyanidation often performs an entirely different function, i.e., one of saving fine grinding.

"Economy being the keynote of successful treatment of low grade ores, the problem often becomes more commercial than metallurgical, and, as there is generally a definite ratio existing between cost of operation, degree of comminution, and percentage of extraction, the grade of ore under treatment usually imposes a limit upon these factors.

"With many ores grinding is the most expensive single item in their treatment, therefore the degree of comminution is very apt to be governed by the allowable cost of operation. With most ores the degree of comminution controls to a great extent the percentage of extraction. So in the treatment of low grade ore it often becomes necessary to sacrifice extraction, through coarse grinding for the benefit of cost, in order that the greatest ultimate profit may be obtained, and it is under those conditions that it is possible for concentration to play an important part in overcoming to some extent the effect of mesh.

"The precious metals occurring in an ore are usually closely associated with the metallic portion of the ore, and as this metallic portion is generally fairly well liberated from the gangue at comparatively coarse meshes, further grinding of the ore is necessary only in order that the metallic portion may be reduced sufficiently fine that the precious metal part of it may be dissolved by cyanide solutions in a reasonable length of time.

"A concentrating table under these conditions would have the effect of removing this refractory metallic portion, it being especially efficient in removing that portion which is not sufficiently fine to be readily dissolved by cyanide solution (the coarse), putting the small amount of high grade concentrate in a separate pile where it can be dealt with by more extensive methods of treatment, it being of sufficient value per ton to justify further grinding, longer contact, and more elaborate methods, at the same time simplifying the subsequent treatment of the bulk of the ore and accomplishing the same result as though the whole mass of ore were ground to a very fine mesh.

"An exemplification of the effect of concentration in connection with cyanidation in the treatment of low grade ores may be found in the mills of the Cripple Creek district, which are treating the sulpho-telluride dump ores. Here concentration performs another function besides that of saving grinding as described above.

On account of the peculiar occurrence of the values in these ores, the sulpho-tellurides occurring upon the faces and seams of the rock, when the ore is crushed to 30 mesh it is found that the sulpho-tellurides are liberated to such an extent that, after concentration and classification, the sand product of this operation is of such low value that it can be rejected as a tailing, leaving only the enriched concentrate and slime to receive further treatment.

"The low treatment costs allowable by this rejection of 50 per cent. of the ore in the form of low grade sand can be well imagined. In fact, the success of these mills in the treatment of this low grade by-product is only made possible through the continual elimination of that material which will not withstand further treatment. This is practised by other methods of concentration besides table concentration, such as hand sorting, coarse crushing and trommeling, etc., and I would like to make a long range prediction that in the future low grade milling selective methods will prevail and concentration become an important factor."

Replying to Mr. Crowe, Mr. Clevenger says:

"The whole question of ore treatment is, of course, an economic one and frequently our pet metallurgical theories have to be sacrificed upon the altar of greatest ultimate profit. If the recovery of a portion of the gold and silver can be more economically made by concentration than by solution in cyanide, obviously concentration should be practised. The case cited by Mr. Crowe is an unusual one in that his strongest argument for concentration is that the sand be rejected without further treatment if the concentrate is removed. It must be remembered, in this connection, that the ore treated runs less than \$3 per ton and that a large proportion of the minerals carrying the gold occur along the cleavage planes. Even with the same character of ore, if of considerably higher grade, it would not be possible to reject the sand without incurring a serious loss. The character of many of the low grade ores of other districts would render this type of practice impossible. Lack of suitable mill sites for a large expanse of leaching tanks, together with favorable smelter contracts, are factors in the Cripple Creek district which are not without their influence.

"There are a number of possible variations of concentration in conjunction with cyanidation, the more important of which are:

1. Crushing of the ore in water concentration, either directly or following another recovery operation, as amalgamation; rejection of the tailing, and cyanidation of the concentrate. This method is most suitable for use upon very low grade ore or tailing. A good example of such practice is the Treadwell, where the tailing from the amalgamation of the very low grade ore treated could not be profitably treated directly by cyanidation; but cyanidation of the concentrate recovered from the tailing by concentration returns a handsome profit.

2. Crushing of the ore in cyanide solution; concentration, followed by cyanidation of the sand and slime. Concentrate treated by one of three methods:

- (a) Shipment of the concentrate to the smelter.
- (b) Special local treatment of the concentrate.
- (c) Special treatment of the concentrate stream, as, for example, fine grinding or amalgamation, etc., and return of the concentrate stream to the balance of the pulp for cyanidation.

Method (a) of concentrate disposal has been very generally practised in the past, but care must be exercised in adopting this practice, for the reason, as I have previously pointed out, that one may pay the



smelter rather dearly for recovering gold and silver recoverable by cyanidation under proper conditions.

Method (b), involving chemical treatment or roasting prior to cyanidation of concentrate, has been practised and, under certain conditions, may be advantageous.

Method (c) has its adherents and, under favorable conditions, may present certain advantages. However, there is at present a tendency to revert from this method to (b), even when it is possible to obtain as high a recovery by (c), for the reason that, if the concentrate residue is kept separate, it may later become a valuable asset.

3. Crushing of the ore in water or cyanide solution and separation of the pulp into sand and slime; concentration of either one or both; rejection of either sand or slime and cyanidation of the other product. An example of this is the old Homestake practice, where, after crushing in water and amalgamation, the slime was rejected, as it was too low grade for profitable treatment until the development of the Merrill filter press. The sand in this case was treated by cyanidation without concentration. At the Portland Victor mill the sand is rejected after concentration and the slime treated by cyanidation."

#### THE CANADIAN CONTRIBUTION TO THE MEDICAL SERVICE IN THE GREAT EUROPEAN WAR.

By Colonel G. Sterling Ryerson, M.D., R.M.O.  
President of the Canadian Red Cross Society.

It may be truly said that never in the history of the world has there been such wholesale slaughter as is now being perpetrated on the battlefields of Europe. No such colossal armies have been seen before. Let us consider what are the probable casualties based on former modern wars. The battle of Magenta was fought in 1859, the French lost 8 per cent. and the Austrians 9.2 per cent. At Solferino the figures are French 8.9 per cent., Austrians 10.3 per cent. In 1866 at Koenigratz the Prussians lost 4 per cent., the Austrians 11 per cent. In 1870 at Froeschwiller the French lost 21 per cent., the Germans 15 per cent. At So. Privat, French 11 per cent., Germans 10 per cent. At the battle of Liao Yang, Japanese 13 per cent., Russians 9 per cent. In the late Balkan war 10 per cent. was seldom passed. It may, therefore, be safely said that the average of killed and wounded will be 7 per cent. of armies engaged, of whom 2 per cent. are killed outright. Therefore, based on these statistics, there will probably be an enormous number of men killed and wounded.

Then comes the matter of sickness. Without going into detail I may say that the average disability in war is 20 per cent. This is sometimes greatly exceeded. The British invalidated 73,977 during the South African war out of an army of 325,000 men. During that war there were 57,684 cases of typhoid, of which 19,454, or 33 per cent., were invalidated, and 8,022, or 13.9 per cent., died. The deaths from typhoid exceeded the total number killed in action. Fortunately typhoid inoculation will make typhoid fever rare among the British in this war, but I have no information as to what percentage if any of the Germans or the Allies have been inoculated. In confirmation of my statement regarding immunity, let me say that inoculation was made compulsory in the American army of 90,000 men in 1911 and has practically abolished the disease. In 1913 there were only three cases and no deaths. Ninety-three per cent. of the British army in India has been inoculated. Formerly about 600 men were lost an-

nually. Last year there were only twenty deaths from typhoid in this army.

Allowing 20 per cent. as an average number of sick it would mean that in the next few months there would be 400,000 sick in the armies of Europe. I do not wish to exaggerate, but this is a modest estimate.

Owing to the secrecy which is being maintained in this war, we are not in a position to say what medical arrangements have been made by the Allies to meet the urgent necessities of the sick and wounded, but I learn by the press that the German estimate of wounded has been far exceeded and that they are in difficulties in that regard.

The Canadian Government has sent 33,400 men. with them will go the following hospitals:

	Beds.
2 General Hospitals, each 520 beds.....	1,040
2 Stationary Hospitals, each 200 beds ....	400
1 Clearing Hospital, 200 beds .....	200
3 Field Ambulances, each 150 beds .....	450

Total..... 2,090

These hospitals are being equipped by the Government, who are also supplying the personnel of medical officers, nurses, orderlies, drivers and cooks. I estimate the number required will be about 1,100.

In addition to the regular and official supplies the Canadian Red Cross Society are supplying large additions of reserve and supplementary stores.

These stores will be under the direct control of the officers commanding the Canadian hospitals, and will be taken by them on the transports to Europe so that they may be immediately available. It will be necessary for the society to supplement these stores from time to time as occasion offers.

It is understood that the Red Cross Societies aid all sick and wounded irrespective of nationality. Once a man is wounded he becomes a non-combatant and object of charity and commiseration.

It should also be stated that the Canadian Society has already since this war began remitted to the Central British Red Cross Committee at London the sum of £10,000 for the general use of the sick and wounded.

Our object in doing this is to bring as quickly as possible, through the agency of the parent Society, which is near the front, aid to the unfortunates of the armies and to avoid the necessary delay in the transport of stores from this country. It seemed to the Committee the most effectual way of giving immediate aid.

Supplies of cocoa, chocolate, arrowroot, cornstarch, jellies, lemons, oranges, sweaters, cholera belts, sleeping caps, pyjamas, socks, coal oil stoves and many other articles were sent to the hospitals at Valcartier and Quebec.

It has been previously stated that 32,400 Canadian troops have been sent to Europe to take part in the great war. It is our duty as well as our privilege to provide for the sick and wounded of this contingent all comforts which may be possible, either directly through our own Society or indirectly through the British Red Cross Society. To accomplish this we must have first MONEY, with which to purchase the necessary articles which cannot be made at home, to contribute cash to wounded and sick soldiers and to pay the running expenses. Therefore, give as your heart dictates. The widow's mite and the millionaire's cheque are equally welcome, and will be faithfully applied.

Money and goods should be sent to the Treasurer, Canadian Red Cross Central Committee, 77 King street east, Toronto, or to the local committees of your district.



# PRE-CAMBRIAN CORRELATION FROM A LAKE SUPERIOR STANDPOINT\*

By C. K. Leith.

Papers presented recently have contained a bewildering variety of suggestions and contentions for revision of the nomenclature and classification of the Pre-Cambrian of Lake Superior and Ontario. When one considers the nature of Pre-Cambrian correlation, its dependence, not upon fossils, but upon lithology, sequence, conditions of deposition, metamorphism, relations to intrusion—in short on physical conditions—and especially when one considers how little is really known about problems of sedimentation, metamorphism and structure, so fundamental to correlation, it is not surprising that there should be various ideas of correlation, and that earlier classifications should be modified or replaced by new ones. The variety of suggestions which have been offered may, at first thought, give the impression that the subject is in the state of hopeless confusion. But analysis of the suggestions indicates that real progress is being made. Their very number and the insistence with which some of them are urged, are indications of the virility of the attack on the problem. It is the purpose of this paper to discuss from the Lake Superior standpoint some of the proposed changes in correlation and names, in the attempt to single out if possible the real advances from the tentative suggestions.

The several papers will be taken up seriatim and then together.

A. C. Lawson—A Stand Scale for the Pre-Cambrian Rocks of North America; International Geological Congress, Toronto, 1913.

Most of the contentions of this paper are not new; they have been urged and considered for many years. This new and emphatic presentation of them by Dr. Lawson seems to call for a restatement of the position of the Lake Superior geologists who have failed to adopt his suggestions. He cites the Lake Superior region as a type Pre-Cambrian region which should serve as a standard for Pre-Cambrian nomenclature and classification, and proceeds to propose such a standard, ignoring, by implication, the fact that a standard has already been established in the field and so well confirmed by the work of so many different geologists and mining explorations that most of it is beyond the hypothetical stage, and must be accepted unless disproved by equally careful and intensive work. The changes are urged on the basis of short examinations of one of the outlying Superior areas, the Rainy Lake district, which has not been mapped in great detail except along the water's edge, and is not nearly so well known as the great iron and copper districts of the Lake Superior region, which have been studied so closely for so many years. They are not based on any new evidence developed in the best known parts of the Lake Superior region—in fact, they do not take account of results of recent work in these areas.

**Coutchiching.**—Keewatin greenstones and green-schists, originally largely basaltic flows, with minor shreds of interlaminated sediments such as iron formation and slate, have been regarded as the base of the Pre-Cambrian succession of the Lake Superior region. Associated with the Keewatin in the Rainy Lake district is a series of micaceous and hornblendic slates and schists, some of undoubted sedimentary origin and some of which are schistose phases of the Keewatin basalts.

To all of these schists Dr. Lawson gave the name Coutchiching. He regards the Coutchiching as lying beneath the Keewatin, and therefore would introduce the Coutchiching series as the lowest member of the standard Lake Superior succession.

Considering the surficial nature of the Keewatin lavas and their known interlamination with sediments, there is no improbability that sediments may somewhere be found below it, but in spite of the fact that Lawson's suggestion was made many years ago, it has not found wide acceptance among students of Lake Superior geology for the following reasons:

(1) In a schistose complex of rocks standing so nearly on edge, it is difficult to prove, in the absence of basal conglomerates, the sequence of adjacent beds. The fact that Coutchiching rocks in some places dip under Keewatin rocks cannot be accepted as conclusive, because in other places Keewatin rocks can be found to be dipping under Coutchiching rocks. In many parts of the Vermilion district there are great jasper beds interlayered with the Keewatin basalts, but mainly above them. Unconformably above both is a series of Huronian sediments in part like the Coutchiching. In certain localities one could argue for the inferior position of the jaspers or Huronian on the same kind of evidence used by Dr. Lawson in his Coutchiching problem, yet the real Vermilion sequence has been ascertained only by the most careful and detailed mapping, over wide areas, checked by mining and exploration development. Until this work is done conclusions based on summer reconnaissance trips within a limited area can be only surmises.

(2) A large part of the series which Lawson originally classed at Coutchiching, in fact one of the largest areas he has described as typical Coutchiching, he now admits is later than and unconformably upon the Keewatin. He calls it the Seine series. This part of the Coutchiching he says is unconformably above another part of the original Coutchiching series. From a detailed consideration of his field work we are doubtful whether he has succeeded in proving this unconformity. Fair consideration of his evidence must lead to the conclusion that this so-called unconformity between two parts of the original Coutchiching is largely inferred and perhaps influenced by the desire to prove such a situation.

(3) Other parts of the original Coutchiching have been found to be merely schistose phases of the Keewatin basalts and not sedimentary. These parts are now eliminated from the Coutchiching. More such parts are likely to be eliminated.

(4) After taking from the Coutchiching the rocks above mentioned, it is doubtful how much, if any, of the series is left to meet Lawson's definition of Coutchiching.

If it should prove that there is a residuum of Coutchiching sediments actually beneath the Keewatin of Rainy lake, it remains to be proved that they are below the lowest Keewatin, and that they are not interbedded sediments in the Keewatin on a somewhat larger scale perhaps than known sediments in the Keewatin in the Vermilion and other districts. In this connection, the fact should be noted that the thickness of the so-called

\*A paper presented at the Toronto Session International Geological Congress, 1913.



Coutchiching sediments has not been determined, and, in the nature of the case, will not be determined for a long time, because folded and fissile slates give very little evidence of original bedding. It may not be said, therefore, on the basis of present evidence that the series is a thick one. In the event of some of the Coutchiching sediment being proved to be beneath the Keewatin of this particular locality, the most that can be said is that there are sediments conformably beneath at least a part of the Keewatin, with no evidence that they are anywhere near the bottom of the Keewatin, or that they constitute anything more than interlayered sediments.

Lawson seemed to recognize the fact that the Coutchiching series is closely related to the Keewatin, and, in fact, a part of the series, when he suggested that both the Keewatin and Coutchiching be subordinated to a general term Ontarian. From our standpoint, if it be found that the Coutchiching is really below the part of the Keewatin found in Rainy Lake, Keewatin is sufficiently general to include both. If, as we suspect, all the Coutchiching is found to be unconformably above the Keewatin, as Lawson now admits that a large part of it is, there is still more reason for retaining the term Keewatin for the basement.

Lake Superior geologists are influenced by another consideration, and that is the existence, in the Vermilion district and its eastern extension into Ontario, to the south-east of the Rainy Lake district, of a series of sediments demonstrated to be unconformably above the Keewatin, and similar in many respects to the Coutchiching sediments. The sequence has been proved beyond question, and is accepted by Lawson in the paper under discussion. In reconnaissance trips through Rainy lake, Lake Superior geologists see a similar series lying in the same apparent relations to the Keewatin and are naturally slow to accept a conclusion that in so short a distance the sequence of two similar series should be reversed. They are rather inclined to take the ground that the more intensive Vermilion study indicates the probable sequence and that the Rainy lake mapping is more in the nature of a tentative approximation of the situation, which may ultimately have to be superseded. There is, of course, danger of too strong a bias being carried over from the Vermilion district, but the situation certainly warrants a conservative attitude in withholding judgment as to the real position of the Coutchiching until detailed work has been done. Certainly, no evidence has thus far been presented which would warrant the introduction of the term Coutchiching into a standard Lake Superior classification, the units of which have all been proved by repeated and careful geological surveys, supplemented by a large amount of underground work.

(5) These facts were all considered by an International Committee composed of representative geologists from the United States and Canada, and this committee refused to accept the conclusion of the inferior position of the Coutchiching. The Canadian members of the committee certainly cannot be accused of any bias against Lawson's views, having adopted them more or less in Canadian publications, and the reference to this committee's report as a "triumph of diplomacy for the geologists who proposed it" is a weak answer to the statements of fact agreed to by the committee.

**Algoman.**—Lawson would introduce the general term Algoman, co-ordinate with Laurentian, for the batholithic acid intrusions into the Middle and Lower Huronian series of Lake Superior. If this be done, an-

other general term should be introduced to cover the batholithic intrusions into the Animikie, and still others to cover the several periods of basic intrusion. We see no need at the present time for the introduction of so many new names. The experience with the term Laurentian has been so unfortunate, in that it has been many times applied without sufficient evidence of age, that one is slow to offer additional waste baskets in which to throw intrusives. There is no difficulty at present with the use of local names for these intrusives. In fact, it would seem that the logical course for the future, as suggested by Sederholm, may be rather to cut from the standard classification the term Laurentian, the only term applied to intrusive rocks, and to use merely local names for intrusions into the different series. However, the term Laurentian has become so entrenched in the literature and there are so many large areas for which the term Laurentian is a convenient one, that probably this logical course will not be followed for many years to come.

In passing, it may be noted that Dr. Lawson argues for the restriction of the term Laurentian to the acid intrusions in the pre-Huronian complex, implying that this is a new suggestion. This restriction is the one which for twenty-five years or more has been used by the Lake Superior geologists and which was urged on the International Committee by these geologists. Lawson's suggestion is, therefore, not for a change, but for the retention of the present standard usage of this term in the Lake Superior region. The International Committee approved this usage, but with the reservation that for present expediency it would be necessary to use the term Laurentian in a broader sense, to include acid intrusives of several ages, for parts of Canada where the term had already been applied in this broader sense and where it was not yet possible to separate the periods of granitic intrusion. From our standpoint the restriction of the term is highly desirable to make it conform to the present Lake Superior usage.

**Eparchaeon Interval.**—The most important of Dr. Lawson's contentions and the one which has been most urgently put forth in the past, is that the greater unconformity beneath the Animikie or Upper Huronian series should be used as the principal basis for classification and regarded as the "Eparchaeon interval." The importance of this unconformity is fully recognized by all geologists who have studied it. Dr. Lawson quotes from Van Hise and Leith's account of it in emphasizing its importance. Lake Superior geologists have mapped and studied this unconformity with the greatest care in connection with their detailed mapping of the Mesabi, Gunflint and Animikie districts where this unconformity is the most conspicuous. In fact these geologists have made almost the only detailed studies that have been made of these districts. Yet they have failed to put this unconformity in the centre of the picture, and are now told that their failure to do so has been a stumbling block to Lake Superior geology, and that thereby even their moral characters are under suspicion. Why is it, then, in spite of the recognition of this great unconformity, that it has not been interpreted as the great Eparchaeon interval?

On the north side of Lake Superior, Animikie or Upper Huronian rests nearly flat upon a highly tilted, highly metamorphosed and much intruded complex of igneous rocks and sediments. When traced to the south into Cuyuna district, only thirty miles south of the Mesabi, the Animikie series in turn becomes in-



truded by granite and is as much folded, metamorphosed and intruded as the sediments below. The same is true of the south side of the lake. Great intrusions of northern Wisconsin are found to be post-Animikie, and even highly metamorphosed terranes like the Quinnesec schists are now regarded as probably Animikie. The soft, yielding nature of the great mass of the Animikie has, in fact, favored more intense metamorphism than in the older series. Furthermore, the principal deformation of the south shore has been post-Animikie, rather than pre-Animikie, the Animikie sediments having been laid down as nearly flatlying Middle and Lower Huronian sediments. Southward from the north shore, therefore, the Eparchæan interval is not the spectacular and easily recognizable structural discordance that is found on the north shore.

When the unconformity is considered for the entire region it becomes apparent that it is no more or less important than another unconformity, that between the Middle and Lower Huronian of the south side of the lake. For that matter, notwithstanding its conspicuous character on the north side of the lake, it is difficult to prove that this unconformity is any more important than that between the Huronian or Keweenaw rocks. All of these unconformities are overshadowed by the great one at the base of the Huronian series. It merely happens that on the north side of the lake, where Lawson and his associates have principally seen it, it has a spectacular emergence. Dr. Lawson admits that there are other unconformities in the pre-Cambrian sediments and presents no evidence to show that these are not fully as important as his so-called Eparchæan interval. When asked why he selected one of the unconformities as the principal basis of classification, and ignored the others, he failed to answer.

In the greater part of the Lake Superior region, particularly in the Marquette, Menominee, Crystal Falls, Iron River and Gogebie districts, the rocks on the two sides of the unconformity marking this so-called Eparchæan interval stand nearly parallel in attitude, with similar metamorphism, and, as a group, have Huronian aspect. It is yet not at all certain what parts of the Huronian rocks of the south shore of the lake are to be finally correlated with the two divisions of the Huronian north of Lake Huron. Also there are parts of the Lake Superior region where rocks are Huronian in their aspect, but where it has not yet been possible to subdivide them, or to correlate them with any one of the Huronian divisions. To make the pre-Animikie or pre-Upper Huronian plane the principal basis for the division of the Lake Superior Pre-Cambrian would leave sediments of identical Huronian aspect both above and below it and would be an entirely arbitrary and impracticable procedure that would not express the facts which a good classification should express.

As a corollary to his emphasis on the unconformity at the base of the Animikie, Dr. Lawson would give different group names to the sediments above and below. Those below he would call Huronian, those above Algonkian. In other words, Huronian would be restricted to the present Middle and Lower Huronian, while Algonkian would be restricted to the present Upper Huronian or Animikie and the Keweenaw. Algonkian and Huronian would be co-ordinate terms rather than Huronian being subordinate to Algonkian. Even if Dr. Lawson were right about the dominant importance of the unconformity, the retention of these two terms in this new sense would introduce great con-

fusion into the literature. In view of the fact that his insistence upon the dominance of this unconformity is due to lack of comprehension by him of the facts of the district as a whole, and especially of the importance of other unconformities, the introduction of new terms has nothing to support it. They would fail to express the facts now expressed by the present classification. For instance, in many areas of undivided Pre-Cambrian sediments it would be necessary to call them "Algonkian or Huronian." In places where the sediments are divided, we should call part of them Huronian and another part identical lithologically, structurally, and in metamorphism, Algonkian. It would be an arbitrary division between series of like character. There would be exactly the same reason for using either of the other two planes of unconformity between Pre-Cambrian sediments as a basis for division between Algonkian and Huronian.

In the earlier days of Lake Superior mapping, several geologists thought it desirable to restrict the term Huronian to the sedimentary series below the Animikie, but as knowledge of the region widened, it appeared that such classification would be applicable to only a very limited part of the region close to the lake on the north shore, and would not be practicable anywhere away from the lake shore, either north or south, for the reason stated in preceding paragraphs.

Emphasis on the pre-Animikie unconformity as the principal basis of classification of the Pre-Cambrian sediments of Lake Superior region is not a new suggestion. Several Canadian geologists, familiar principally with this unconformity as it appears on the north side of the lake, have made suggestions of a similar sort. The difference in emphasis on this unconformity has been an unfortunate source of controversy between United States and Canadian geologists. It seems to us that this undue emphasis on the pre-Animikie unconformity has been due almost entirely to failure to look beyond the north shore of the lake and consider this unconformity in its manifestations on the south and west sides of the lake. If it were true, as has been argued repeatedly in recent years, that this unconformity everywhere separates highly metamorphosed, intruded and folded sediments and later, flatlying, little metamorphosed, folded and intruded sediments, then it would be reasonable to use it as a practical basis of field classification, but this is true only in limited parts of the Lake Superior region, and is emphatically not true when considered for the region as a whole.

W. H. Collins—A classification of the Pre-Cambrian formations in the region east of Lake Superior; International Geological Congress, Toronto, 1913.

This paper is of especial interest as summarizing the recent work of the Canadian Geological Survey in the area east of Lake Superior. Considerable advances have been made in areal connections of formations, particularly between the Sudbury and the Cobalt districts. Mr. Collins makes an effective plea for the use of local names in the present stage of mapping in order not to have the situation confused by the application of general terms from without. This is highly desirable, for while there is now substantial agreement as to local successions and names, there are a variety of opinions as to how these should be so correlated with the Huronian and other series of Lake Huron and Lake Superior. Mr. Collins' classification is as follows:



Pleistocene.	
Unconformity.	
Silurian (Niagara).	
Unconformity.	
Nipissing diabase,	} Keweenawan.
Sudbury norite, etc.	
Intrusive contact.	} Huronian.
Whitewater series.	
Lorrain series.	
Local unconformity.	
Cobalt series.	
Great unconformity.	} Pre-Huronian.
Batholithic granite intrusives.	
Intrusive contact.	
Sudbury series, Temiskaming series,	
Fabre series, etc.	
Unconformity.	
Granite intrusives.	
Keewatin group.	

There is in this great region a great unconformity separating little metamorphosed and folded sediments (Cobalt series, etc.) from a much more metamorphosed and folded basement (including Sudbury, Temiskaming and other sediments) intruded by great granite batholiths. This seems to Mr. Collins to mark a great dual division of the Pre-Cambrian. The rocks above he would call Huronian, those below pre-Huronian. There is likely to be little dissent from his use of local names, the sequence of rocks, and the emphasis for practical field purposes on the unconformity below the upper group of sediments, which have not been intruded by plutonic granites. His use of the general terms Huronian and pre-Huronian for the two great divisions, however, involves a correlation with the north shore of Lake Huron which is tentative.

Miller and Knight—Sudbury, Cobalt and Porcupine Geology; Engineering and Mining Journal, June 7th, 1913.

Miller and Knight have studied for the Ontario Bureau of Mines the Sudbury, Cobalt and Porcupine, and other areas which have been studied independently by the Canadian Geological Survey. Their conclusions, published at the same time as Collins', show a remarkable agreement on essential facts. Their succession follows:

- Dikes of aplite, diabase, etc.
- Intrusive contact.
- Nipissing diabase.
- Intrusive contact.
- Cobalt series.
- Erosion contact.
- Lorrain granite.
- Intrusive contact.
- Temiskaming series.
- Erosion contact.
- Laurentian granite and gneiss.
- Intrusive contact.
- Grenville series.
- Keewatin.

The essential difference between this table and that of Collins is that it includes the Grenville series, which is regarded as conformably superposed upon the Keewatin, in much the same manner as the Soudan iron formation of the Vermilion district, Minnesota, is superposed upon the Keewatin. They argue that the Grenville, being a much more extensive sedimentary series than the Soudan iron formations in the Vermilion district, should have a place such as that accorded

to the Keewatin, Laurentian, Huronian or the Keweenawan. They do not emphasize any particular unconformity of the Pre-Cambrian and suggest general correlation only in the most tentative terms, implying that most of the Cobalt and Temiskaming series may be found represented in the original Huronian district, and therefore may be called Huronian. The assignment of the Grenville to a position below the Huronian is based on its close association with rocks of supposed Keewatin age and upon the existence of limestones beneath the Cobalt and Sudbury groups of sediments. Miller and Knight's work in the Grenville-Hastings area near Madoc, which is almost the first attempt to determine the structure and sequence of the Grenville, seems to bear out the conclusion that the Grenville series is related to a greenstone basement and is overlain by sediments of the Huronian type. The Grenville series as a whole is separated areally from the typical Huronian rocks and no place has been found where definitely recognizable type exposures of both are in juxtaposition. Until such places are found the assignment of the Grenville to a pre-Huronian period must be regarded as tentative.

A. P. Coleman—The Sudbury Series and its bearing on Pre-Cambrian Classification; International Geological Congress, Toronto, 1913.

Rocks which had in earlier work been classed generally as Huronian in the Sudbury district are now divided into a lower series of quartzites and graywackes, tilted, more or less metamorphosed and intruded by granites, lying unconformably below a flat-lying conglomerate (Ramsay Lake) which has been traced by Collins into the basal conglomerate of the Cobalt series. Unconformably above both are the little metamorphosed sediments of the Sudbury basin (Whitewater series). Coleman calls the lower series the Sudbury series. He restricts the Huronian to the Ramsay Lake conglomerate. The upper series he calls Animikie. The granite and gneisses intrusive into the Sudbury series, but older than the Huronian or Cobalt series, are called Laurentian, on the ground that intrusives of this type constitute the greater part of what has been called Laurentian in the past and that granites and gneisses unconformably below and older than the Sudbury series are in such limited amounts that the restriction of the term Laurentian to them would be a departure from past procedure. The Sudbury series is regarded as later than the Keewatin on the assumption that the relations are the same as in the Michipicoten district, where the Dore conglomerate, or the supposed equivalent of the Sudbury series, rests unconformably upon the Keewatin. The supposed Grenville rocks and the Sudbury series occur within a mile of each other near Romford. Both have been involved in the so-called Laurentian upheaval. It is possible that the supposed Grenville rocks are merely a portion of the Sudbury series sunk to greater depth in the invading Laurentian magma, but they are regarded as probably older than the Sudbury series.

Coleman agrees with Collins in emphasizing the break above the Sudbury series and in calling the Sudbury series pre-Huronian. He differs from Collins in not including in the Huronian the upper series, calling that Animikie. The discrimination of Animikie from Huronian has also been made by Lawson.

Morley E. Wilson—The Significance of Recent Developments in the Pre-Cambrian Stratigraphy of the Lake Superior-Lake Huron Region; Journal of Geology, Vol. xxi, 1913, pp. 385-98.



Wilson emphasizes the existence of a dual division of the Pre-Cambrian through the area extending from the north shore of Lake Huron north-east through the Sudbury, Cobalt, Porcupine, Larder Lake and Mistassini districts, in all of which gently golded sediments, not affected by granite batholiths, rest upon a highly metamorphosed, folded basement intruded by granite batholiths. In the first division he includes the Cobalt series, the original Huronian sediments and their equivalents. The lower series includes the Keewatin green-schists, closely associated with sedimentary rocks described under various local names—Pontiac schist, Fabre series, Timiskaming series, Sudbury series, etc., all of which are intruded by Laurentian batholiths. The emphasis on the great plane of unconformity above the series affected by batholithic intrusions and the attempt to make this a basis for correlation and nomenclature is similar to that argued by Collins, but Wilson favors an enormous extension of this idea, namely, that this great plane of unconformity is the one beneath the Animikie on the north shore of Lake Superior and that it also extends under all of the Huronian formations on the south side of Lake Superior. He bases his argument for the extension of this plane beneath the Huronian of the south side of Lake Superior upon (1) an assumed absence of batholithic intrusions in the Huronian or Animikie on the south side of Lake Superior; (2) on the possibility that in the limited areas of pre-Huronian schists of the south shore of Lake Superior there may be sediments which have thus far been overlooked, corresponding to the Lower and Middle Huronian sediments on the north shore of the lake; (3) on the lithological differences between pre-Animikie sediments on the north and south sides of the lake. In view of the fact that all of the Huronian rocks on the south side of the lake, including the Animikie, are fundamentally metamorphosed and deformed by batholithic intrusions, as shown especially in the Cuyuna, Menominee and Florence districts, and in view of the fact that no trace of sedimentary series associated with the Keewatin beneath the Huronian has been found in detail studies over many Lake Superior areas, Wilson's interesting suggestion must be regarded as only tentative, without substantial basis of evidence. The paper was written without knowledge of the recent discoveries of extensive batholiths into the Huronian rocks, which had not yet been fully discussed in literature, although they appear in accounts of the Cuyuna iron range. So far as the writer can see, there is no new evidence to warrant change in the suggestion made some years ago by Van Hise and Leith in Monograph LII. of the U.S.G.S., as follows: "It thus appears that the assignment of the rocks under discussion (Lower-Middle Huronian north of Lake Superior) to the general place of Lower Huronian and Middle Huronian is unquestioned. But as large portions of these rocks may be land formations, they cannot be exactly correlated with the aqueous deposits of the Middle and Lower Huronian to the south. The deposition of land sediments may well have begun earlier than that of the aqueous deposits or it may have continued later."

**Conclusion.**—The main feature that is common to three of the preceding papers is emphasis on the existence of a great plane of unconformity in parts of Ontario and the Lake Superior region, separating an upper series of unmetamorphosed and little folded sediments from a deeply eroded basement of highly folded and metamorphosed sediments intruded by granite batholiths, and the assumption, specifically stated or implied, that this unconformity is the same in age in widely separated districts.

With this essential idea as a basis, general terms are used for correlation on which the various writers show little agreement. Coleman restricts the Huronian to the lower of two series above the unconformity in the Sudbury district, using Animikie for the upper. Collins and Wilson are inclined to restrict the term Huronian to the series above this unconformity. Wilson argues that this unconformity really goes beneath the Huronian of the south side of Lake Superior. Lawson, on the other hand, carries it only beneath the Animikie. He would use the term Algonkian for the rocks above this unconformity and the term Huronian for post-Keewatin sediments below this unconformity. Miller and Knight adhere rather closely to local terms, though they suggest correlation of sediments both above and below this plane with "Huronian" sediments of the original Huronian district.

It is assumed that there is only one plane of unconformity of this sort, which is very widespread. Collins has traced an actual areal connection of this unconformity between the Cobalt and Sudbury districts, and lithological and structural similarities probably warrant its extension to certain outlying areas in Ontario and Quebec. This is a definite and satisfactory step in advance. That this plane is the same as that beneath the Huronian sediments of the original Huronian district or that beneath the Animikie of the north shore of Lake Superior, or that beneath the entire Huronian series of the south side of Lake Superior, is an assumption not based on areal connection, but projected because of certain crude similarities across wide areal gaps. So far as the Lake Superior region is concerned, there is no warrant for the use of this plane as the main basis of classification. One has only to recall the short distance of 30 miles between the Mesabi and Cuyuna districts, in which this plane of unconformity becomes tilted and folded by reason of batholithic intrusions into the series above this plane, the upper beds being fully as much metamorphosed, in some places more metamorphosed, than the beds below. Also throughout the southern central portion of the Lake Superior region, including the Gogebic, Marquette, Menominee, Crystal Falls and Iron River districts and northern Wisconsin, the simple and conspicuous elements of this unconformity are obscured by folding and later batholithic intrusions. In this part of the region there is another unconformity within the Huronian sediments, of equal magnitude so far as any one can tell. In this part of the region also, these unconformities are not more significant than the unconformity between the Keweenaw and Huronian. All are overshadowed by the great plane at the base of the Algonkian. These being the facts, anyone urging that the pre-Animikie unconformity of the type observed on the north side of Lake Superior is the Eparchaeon interval, which should be used as a main basis of classification for the Lake Superior region, virtually ignores such facts.

If it is impossible to use such an unconformity as the main basis for classification and correlation between near-lying districts within the Lake Superior region, it is clear that any attempt to extend it across greater unknown areas to the original Huronian and Sudbury districts is only a guess affording a very doubtful basis for correlation. The distances are much larger than those in Lake Superior district in which remarkable changes in this plane are known. Considering the complete change in the aspect of the "Eparchaeon" unconformity within short distances in the Lake Superior region, which has been proved again and again by detailed study, it seems desirable in the



present state of knowledge that the use of such a plane for purpose of correlation in Ontario should be tentative. It is entirely conceivable and probable that some of the highly folded and metamorphosed sediments in one area may turn out to be equivalent to the little folded and nearly flat-lying sediments in another, the difference being due to batholithic intrusions. Considering the widespread distribution of batholithic intrusions of at least three great periods in the pre-Cambrian, now definitely recognized, it would indeed be surprising if this situation should not be found in many parts of Ontario, and so far as it is found, the use of an unconformity rendered conspicuous by batholithic intrusions in the lower series is not conclusive as a basis of classification and general correlation.

Emphasis on lithology alone as a basis for correlation is now regarded by all as dangerous. The emphasis in the papers above referred to is not only on lithology, but on structural and metamorphic characteristics and relations to intrusions. The basis has been broadened, but it is still not final.

**We conclude**, then, that in each of the pre-Cambrian districts above referred to, the general sequence and structure are fairly well agreed to and there is little opportunity for dispute as long as local names are used. A probable exception to this is the assignment of the Couchiching to a position below the Keewatin of Rainy Lake. In the Lake Superior region it has been possible with reasonable certainty, to group the various formations and series into general divisions for the region as a whole. Within the Lake Superior region correlation still presents many problems, but as a whole it has been substantially checked by the work of so many men and organizations, through so many years, that it is past the hypothetical stage. Correlation of certain Ontario districts which are not far separated has also reached a sound basis. When the attempt is made to correlate the Lake Superior formations with those of the several Ontario districts, or those of widely separated districts in Ontario, such correlations in the present state of knowledge must be regarded as largely preliminary and tentative, and certainly not sufficient to warrant sweeping changes in general nomenclature in any district. There seems to be a tendency to place too much confidence in the maintenance of the uniformity of a plane of unconformity and the assumption that planes of this type found in different parts of the same region are necessarily one and the same plane. As a working hypothesis for near-lying areas, it is extremely useful. When this assumption of uniformity of such a plane, found in certain areas of Ontario, is carried over to the Lake Superior region, it runs squarely against a vast body of ascertained facts. It furnishes an insufficient basis or warrant for any drastic revision of the division or correlation of the Lake Superior rocks. This classification has grown by a process of evolution during many years of laborious study of the area. However, it may fit elsewhere, it certainly expresses the facts essentially for the Lake Superior region. If it be discarded or seriously modified it will be as a result of studies of the Lake Superior region itself. Inferences drawn from distant areas may be helpful and welcome, but not in themselves decisive.

(To be Continued).

#### GRANBY CONSOLIDATED.

Granby has divided its properties into four operating units—Southeastern British Columbia, British Columbia Coast, Southwest Alaska, from Skagway west, and

Southern Alaska. Each district will have a local superintendent.

The Anyox smelter, the new plant at Hidden Creek, should be able to produce 2,400,000 pounds of copper monthly, according to management plans, or at the rate of 28,800,000 pounds a year. This statement was made by President Nichols to stockholders at their annual meeting Tuesday in New York.

There has been spent on new construction about \$3,000,000 and while this work has about ended, a reverberatory furnace may be added to the Anyox smelter. The existing units may eventually be enlarged to handle a greater tonnage of ore than now planned for.

The policy of expansion, adopted several years ago, will be continued. In addition to acquisition of the Midas, Mamie and Dean mines and the working option on the It mine, near the Dean, the company has other properties under examination, some of which are expected to develop satisfactorily.

The Midas and Mamie mines could have been prepared for shipments by Oct. 1, but work was suspended pending improved copper market conditions.

The Anyox investment now stands at \$2,888,737 against \$2,038,186 on June 30, 1913. The mines lately purchased and now under development cost the company \$468,135.

#### ACCIDENTS IN METAL MINES IN U. S.

"It is gratifying to note that the fatality rate in the metal mines of the United States was lower in 1913 than in 1912," says Albert H. Fay, engineer of the Bureau of Mines, in a technical paper just issued.

"The number of men employed during 1913 was 193,088, as compared with 169,199 for 1912. The fatality rate was therefore 3.54 per 1,000 men employed as against 3.91 per 1,000 for the year 1912, and 4.19 for 1911.

"While the total number of persons killed in the metal mines during 1913 was slightly more than in 1912, there were about 24,000 more men employed, so that the rate is reduced to 3.54 per 1,000 employed during 1913, as compared with 3.91 for 1912. A number of the states show a slight increase, but a majority of the principal mining states show marked decreases as follows:

"The important mining states showing a continuous reduction of fatality rates during 1911, 1912 and 1913 are Idaho, Michigan, Montana, Nevada, New Jersey, South Dakota and Utah, representing in 1913, 38 per cent. of the mining industry. Of the states showing a decreased fatality rate during 1913 as compared with 1912 only, may be mentioned Alaska, Alabama, Colorado, New York, Oklahoma, Tennessee, Wisconsin and Wyoming.

"This gradual reduction is to be accounted for largely by the introduction of safety appliances, better supervision and a more strict enforcement of rules and regulations of the mining companies, and a closer observance of the State laws. Practically all of the larger companies, and many of the smaller ones, have done much in safeguarding their employees. They have inaugurated the 'safety first' movement with the results above mentioned. By first-aid treatment many slight injuries have been cared for, pain relieved, and a cure effected in a short time, so that many of these injuries have been of short duration and kept out of the 'serious injury' or 'fatality' class."



# THE COMPOSITION OF NATURAL GAS\*

By G. R. Mickle.

For convenience we may consider that there are three broad classes of natural gas, viz: (1) The "dry" commercial gases, that is, those that are found in such quantities that they are capable of utilization and are not intimately associated with oil; (2) The "wet" gases found in oil wells; (3) Those that are of no value, due either to lack of sufficient combustible constituents or their occurrence in insignificant quantities. It is the "dry" commercial gas with which we are concerned in Ontario, there being no evidence at present of the existence of "wet" gases in any important quantity.

Before proceeding further it may be as well to explain briefly the nature of the most important constituents, viz: the various hydrocarbons belonging to what are called the paraffin series or the saturated hydrocarbons which have the general formula  $C_n H_{2n+2}$ ; e.g. where  $n=1$ , formula is  $C H_4$  and so on.

The only ones found in the dry Ontario gases are: Methane ( $C H_4$ ) with heating power of 1067 B.T.U.; Ethane ( $C_2 H_6$ ) with heating power of 1865 B.T.U.; Propane ( $C_3 H_8$ ) with heating power of 2665 B.T.U. B.T.U. standing for British Thermal Units per cubic foot of gas.

The only other constituent in natural gas having any heating value is hydrogen sulphide with 689 B.T.U.

Taking all the reliable information available at present regarding the composition of the "dry" commercial gases, and it must be remembered that it is necessarily incomplete as it is not conceivable that all the variations and peculiarities in gas which may exist are known at the present time, we find that methane is the chief constituent. In some rare cases, perhaps, it is the only one, but usually with it are other hydro-carbon compounds, e.g. ethane or propane, and also, nitrogen, carbon dioxide and sometimes hydrogen sulphide. Many analyses published will show oxygen, carbon monoxide, olefines or illuminants, but the most reliable evidence points to the probability that these constituents never exist in natural gas. None of these were found in any of the gases examined from Ontario. At the present as far as the writer can ascertain the maximum amount of the various constituents other than methane which are known to exist in "dry" commercial gases are as follows: Ethane, 27 per cent.; propane, 6 per cent.; nitrogen, 46 per cent.; hydrogen-sulphide, 0.8 per cent.; carbon dioxide, 6 per cent.; helium, 1.5 per cent.

These limits as stated before are certain to be extended by the analyses of gas discovered in the future. Extensions of these limits it will be seen can only increase the number of gases which may exist and therefore make the reasoning employed later on more forcible.

It is clear that "dry" commercial gas is not a chemical compound, but is a mixture of the above mentioned different gases, the relative proportions of which are not regulated by any chemical laws, but any one of the constituents mentioned, ethane, nitrogen, etc., may vary from zero to the maximum given above for each. The resultant natural gas is a combination of certain different gases and the number of combinations or the number of different natural gases which might exist is, therefore, capable of calculation by the ordinary

mathematical laws, just as the combinations of any other kind of things.

The following are analyses of natural gas from Ontario wells:

## Analyses Ontario Natural Gases.

By Prof. W. H. Ellis, J. W. Bain, E. G. R. Ardagh, Chemists.

County and Well.	H <sub>2</sub> S	CO <sub>2</sub>	O	CH <sub>4</sub>	C <sub>2</sub> H <sub>6</sub>	C <sub>3</sub> H <sub>8</sub>	N	dens- ate. well.	lbs. on
Kent No. 1.....	†	0.1	*	76.1	18.0	*	5.8	....	565
Kent No. 2.....	0.3	*	*	84.4	10.8	*	4.5	10.6	522
Essex No. 1.....	0.3	*	*	87.6	7.3	*	4.8	....	50
Kent No. 3.....	0.6	0.1	*	86.0	8.5	*	4.8	....	436
Kent No. 4.....	0.5	0.05	*	86.8	7.9	*	4.8	....	400
Kent No. 5.....	0.4	0.3	*	83.4	10.6	*	5.3	....	450
Kent No. 6.....	0.8	*	†	78.2	15.7	*	6.1	....	418
Kent No. 7.....	0.8	?	*	84.1	8.5	*	5.8	....	519
Kent "Surface" Tp.									
Howard.....	*	*	*	83.0	*	*	17.0	....	50?
aKent "Surface"									
Tp. Ranleigh....	*	0.1	0.3	92.9	*	*	6.7	....	?
Lambton No. 1....	*	*	*	68.3	12.5	3.4	15.8	11.6	830
Lambton No. 2....	*	*	*	69.0	15.7	1.8	13.5	9.1	830?
Lambton No. 3....	*	*	*	80.2	11.7	*?	8.1	....	?
Elgin No. 1.....	*	*	*	84.1	10.8	*	5.1	....	350
Norfolk No. 1....	*	*	*	84.4	6.8	*	8.8	....	400
Norfolk No. 2....	*	*	*	83.8	7.7	*	8.5	....	545
Norfolk No. 3....	*	*	*	75.8	14.2	*	10.0	....	?
Haldimand No. 1...	*	*	*	67.8	16.0	3.5	12.7	17.6	275
Haldimand No. 2...	*	*	*	79.7	11.4	*	8.9	10.8	300
Haldimand No. 3...	*	*	*	76.7	14.6	*	8.7	....	10
Haldimand No. 4...	*	*	*	81.4	11.7	*	6.9	....	140
Haldimand No. 5...	*	*	*	79.4	14.3	*	6.3	....	225
Haldimand No. 6...	*	*	*	81.8	11.8	*	6.4	....	250
Haldimand No. 7...	*	*	*	76.6	16.3	*	7.1	10.8	285
Haldimand No. 8...	*	*	*	76.3	15.4	*	8.3	....	250
Haldimand No. 9...	*	*	*	84.9	8.3	*	6.8	....	87
Haldimand No. 10...	*	*	*	77.6	15.4	*	7.0	....	100
Haldimand No. 11...	*	*	*	77.8	14.7	*	7.5	....	100
Haldimand No. 12...	*	*	*	80.0	11.4	*	8.6	....	?
Wentworth No. 1...	*	*	*	80.2	13.1	*	6.7	....	186
bBrant No. 1.....	*	*	0.1	76.9	8.0	1.2	13.8	7.8	20
Brant No. 2.....	*	*	*	68.6	19.0	*	12.4	14.7	?
Brant No. 3.....	*	*	0.05	74.6	15.4	*	10.0	....	?
Welland No. 1....	*	*	*	74.8	17.3	*	7.9	15.6	50
cWelland No. 2....	*	*	0.2	80.0	12.9	*	7.1	....	100
Welland No. 3.....	*	*	*	82.1	13.5	*	4.4	....	100
Welland No. 4.....	*	0.05	0.05	83.6	12.0	*	4.3	....	120
Welland No. 5.....	*	0.15	0.05	93.7	3.3	*	2.8	....	50
Welland No. 6.....	*	*	*	75.6	15.5	*	8.9	....	185
Welland No. 7.....	*	*	*	85.9	8.7	*	5.4	....	6
York No. 1.....	Result given separately below								
York Scarborough Tp.									
"Surface".....	*	1.65	*	85.15	0.0	*	13.2	....	5

\*None. †Trace. (a) As this gas was probably in contact with water and might have taken oxygen from that, we cannot assume the O was due to sampling; no correction is, therefore, made. The sample was taken by displacing water. (b) This is the highest O in any sample taken with water. The rubber tubing was blown off during operation; no correction made (c) Corrected to air free sample. Taken "dry."

## Analysis of York No. 1 by Prof. E. G. R. Ardagh.

Carbon dioxide .....	0.1
Carbon monoxide .....	1.2
Ethane .....	3.1
Hydrogen .....	none
Hydrogen sulphide .....	none
Methane .....	86.0
Olefines .....	1.3
Oxygen .....	none
Nitrogen .....	8.3

Note.—The carbon monoxide and olefines appear in the analysis at the expense of the methane and ethane, but the relative proportions in which this took place are not known.



### Influence of Geological Formation.

The analyses as far as the evidence goes do not appear to show that the geological formation in which the gas is found has any influence on the composition. In taking the samples from Welland County a special effort was made to ascertain this. Gas is found in four different rocks in that county, viz.: the Clinton, average depth about 700 ft., Red Medina 765 ft., White Medina 810 ft., and Trenton. As many wells derive their gas from two or more of these sands, the drilling records were examined carefully to select wells which yielded gas in only one formation. Accordingly 1 and 2 were taken to represent the White Medina and 3 and 4 the Clinton, and 5 the Trenton. Red Medina was left for Haldimand county. But it is seen that No. 2 is similar to 3 and 4 and different from 1. Afterwards two more samples were taken in Welland—No. 6 in White Medina and 7 a mixture of Clinton and White Medina gas. If we conclude that the White Medina gas is higher in ethane than the Clinton basing that on 1 and 6, then the results of 2 are inconsistent with this. Moreover, No. 7 is lower in ethane than either of the other Clinton or White Medina gases, although it is a mixture of the two. No. 5 is from the only well in the Trenton consequently we cannot say whether the low ethane and nitrogen is due to the influence of the rock or its position. Coming into Haldimand, No. 1, the highest ethane, is in White Medina; 7 and 8 are the next highest and are in Red and White Medina respectively. The lowest ethane in Haldimand is No. 9 in Red Medina, and so on—no definite differences.

In the western fields the gas is all obtained from one formation in the same field.

### Influence of Declining Pressure on the Composition.

In the old field of Welland-Haldimand, etc., a number of wells which are almost exhausted were sampled purposely to see if there was any difference between the low and high pressure wells. The viscosity of a gas, or the measure of the difficulty with which it flows through an orifice of any kind, is supposed to vary directly with the square of the specific gravity, that is, the one with the higher density would find its way less readily through the pores and consequently we should expect the low specific gravity constituents to escape first, and, therefore, there would be a concentration of the higher density gases in wells that are nearly exhausted. Taking the specific gravities of the gases constituting natural gas, and it will be sufficient to use approximations, we have 0.6 for methane, 1.0 for ethane, 1.0 for nitrogen, and 1.5 for carbon dioxide; then the square of methane density is .36 and carbon dioxide 2.25 or methane should escape about six times as readily as carbon dioxide. Hence there should be a concentration of carbon dioxide in an old well. Unfortunately this latter gas which would be our best indicator is practically absent in the Ontario gases. Welland No. 5 is the only one in the eastern part showing more than a trace. Since this well has experienced the greatest drop in pressure of all—from 1,000 lbs. to less than 100—we should expect to see it higher in carbon dioxide, as indeed, it is, and also, higher in ethane and nitrogen. Actually it is lower in these latter two than any other of the gases in that vicinity. A careful scrutiny of the list of analyses of gas from Haldimand will show that there is no apparent concentration of ethane and nitrogen in the nearly exhausted wells. Of course we have no proof that all of them are not higher in these two gases than they were originally.

### Uniformity of Composition of Natural Gas in Ontario.

The most striking feature in the whole set of analyses is the wonderful uniformity of the gas derived from widely separated, and as far as the information from drilling goes, totally disconnected areas. For instance, the sample from the small field in Elgin which is 80 miles from the Kent field is almost identical with the normal gas from the latter area, the ethane being only 1.5 per cent. higher than the mean of normal Kent gas, and the nitrogen agreeing within .1 per cent. If a dash of hydrogen sulphide were added to this gas it would agree exactly with the Kent product, or conversely remove that fraction of one per cent. from the Kent and Essex gas and all these three would agree. Yet Kent is separated from Essex by twenty miles and Elgin from Kent by eighty. By the addition or subtraction of a very few per cent. of one or more constituents most of the apparently quite separate areas would be yielding the same gas. The almost complete absence of carbon dioxide in the Ontario gases is peculiar, only one sample in all the 27 examined from Elgin eastwards showing the small quantity of .15 per cent. and one a few hundredths of a per cent. An examination of the analyses quoted from other territories shows that carbon dioxide is more often present than not. When we consider that there are more than a hundred ways in which two dry commercial gases can differ and only one in which they can agree, this uniformity is surprising. It seems to be incompatible with a local and separate origin for each field. We can understand why the oxygen and nitrogen of the atmosphere are found in constant proportions in all parts of the world. There is only one atmosphere. Those who have theories to defend may be left to adjust them to the observed facts.

### Surface Gas.

The occurrence of gas in the drift in many places in Ontario is of both economic and scientific interest. Analyses are given of this kind of gas from two different localities in Kent county and one in York. In one place as explained above, this gas has been in use for 21 years in several houses and shows no manifest sign of diminution. To form some idea of the quantity this involves the writer secured through the kindness of the Union Natural Gas Company which has a number of pipe lines traversing the County of Kent, an estimate of the average amount of gas consumed by a household in the territory they serve. Twenty farm houses were taken at random and the average amount of gas they use per year was ascertained. The price paid there is 15 cents per thousand feet and the average consumption is 220,000 ft. per year per household. In the County of Welland similar figures were obtained from the Provincial Natural Gas and Fuel Company, the average consumption per household came to 102,000 cu. ft. per year, the price of gas being 30 cents per thousand. There is no climatic or other reason except the price why the consumption should be higher in one place than the other. It is certain that households using gas which costs nothing will not consume less. The quantity is more likely to be 300,000 ft. per year or more, so that the total amount consumed by one of these houses in 21 years is probably six million feet or more.

All these gases examined contained over 80 per cent. methane and therefore probably have a calorific value of over 800 B.T.U. per cubic foot, methane having over 1000. The cheapest artificial gas sold in Ontario is in Toronto, where the price is 70 cents per thousand and for a gas with a heat value of about 600 B.T.U. If one were buying this natural gas on the same basis,



the price should be about 90 cents per thousand. It would no doubt be considered a boon in many houses if it could be delivered into the country at that price. A value of 50 cents per thousand could reasonably be put on this natural gas. This is equivalent to \$500 per million, so that the value to the households of the six million feet used is not less than \$3,000. As explained already, several farms in Howard township have used this gas. There are also some in other parts of Kent county. The probabilities must be strong that there are a number of places in Scarborough township also where a supply of gas could be obtained from the drift for years sufficient for individual houses provided reasonable economy is employed.

#### Effect of Water on Natural Gas.

As natural gas might come in contact with water in the drift, the possible effect of this on the composition should be considered. The facts given below are taken from Landolt u. Boernstein's Tabellen 4ten Auflage, and show the solubility of the various constituents of natural gas in water at various temperatures from 0 to 20 deg. C. or 32 to 68 deg. F. The amounts given are the number of volumes of the different gases soluble in one volume of water at different temperatures.

	0 deg.	5 deg.	10 deg.	20 deg.
Oxygen. . . . .	.0489	.0428	.038	.031
Nitrogen. . . . .	.0239	.0215	.019	.016
Carbon dioxide . . .	1.713	1.424	1.194	0.878
Methane. . . . .	.055	.048	.042	.033
Ethane. . . . .	.099	.080	.066	.047
Hydrogen sulphide	4.686	4.063	3.520	2.672

It is seen at once that carbon dioxide and hydrogen sulphide are vastly more soluble than the other constituents of natural gas, which do not differ greatly in this respect and consequently water could not change their relative proportions materially. Water saturated with carbon dioxide at a temperature just above zero should release some of this in percolating downwards owing to rise of temperature. Consequently if drift gas comes in contact with water we must expect carbon dioxide.

#### Oxygen in Water and Natural Gas.

The behavior of oxygen in water may throw some light on the absence of this constituent in natural gas. Thorpe's Dictionary of Applied Chemistry under "Water" gives the amounts of nitrogen, oxygen and carbon dioxide present in rain water as 1.308, 0.637 and 0.128 per cent, respectively, and in discussing drinking waters it is said: "The gases present in ordinary drinking waters are those of the atmosphere, oxygen, nitrogen and carbonic anhydride (carbon dioxide). Their quantitative determination is rarely made as they are of little or no significance in connection with the quality of water for drinking, excepting that through the absence of the dissolved gases a water has the flat taste of that which has been recently boiled. It is sometimes supposed that the absence of a due proportion of dissolved oxygen in water is an indication of the presence of decomposing organic substances, but this can only be the case with surface waters, as the very purest subterranean waters are almost destitute of it." The purest waters are those that have percolated most, the oxygen being so active attacks different compounds in the soil and is eliminated. If it is thus removed from water it seems likely that even if there were oxygen in gas when it is formed it would be removed in the same way.

#### Relation of Surface Gas to the Deep Rock Gas.

Whether this "surface" gas has escaped from below

or been formed in the drift, its composition is worth investigation. If it comes from below, unless it can be shown that the composition could be altered in some way there should be an agreement. As pointed out already in the discussion of the deep rock gases, there does not appear to be any reason why we should believe that the differences in specific gravity of the various constituents of natural gas have caused a concentration of the higher density ones. As has been explained already, evidence on this point is not complete and definite. An effort was made by the writer to secure samples of "surface" gas over known gas producing rock, but unsuccessfully. According to the drillers, gas is found in the drift frequently in drilling in the Kent field, possibly something like one-third of the wells showing it. At the time the samples were being collected none was available.

#### RHEIMS.

It is now proposed that any offerings for the restoration of the cathedral at Rheims should be devoted to the rebuilding of homes in northern France and that the cathedral remain a monument, as they say in Paris, "to German vandalism."

One familiar with the history of the Catholic Church and art, writes the Boston News Bureau:

"The devastation of our Lady of Rheims will live in history as a monumental crime. No more sacred shrine than Rheims exists in the Frankish or Teutonic world. It was at Rheims that Clovis was crowned and it was in that sacred sanctuary the kings of France were crowned for a thousand years. The present church dates back to the Crusades when France out of gratitude for its deliverance from Mohammedanism undertook to rear aloft a temple of religion worthy of France and of Our Lady.

"A holy guild of workers was formed and for fully two hundred years they labored incessantly building and beautifying this incomparable creation of genius and piety. It was not only a magnificent temple of worship; it was also a peerless temple of art. Its windows were incomparably beautiful. No ruby, sapphire or emerald ever surpassed in loveliness the light that streamed through those exquisite creations of mediaeval art. Priceless masters were everywhere, paintings by masters long since dead whose inspiration came from visions of angels. Tapestries that the world can never duplicate all blended into one great harmonious whole. All through the Dark Ages Goth and Hun and Vandal spread havoc and ruin through this fair land, but they knelt in awe at the shrine of Rheims. The sacred oil was poured upon the first Gothic Christian king at Rheims and even the 'Scourge of God,' Attila, did not dare to ravage this temple. Nearly five hundred years ago Joan of Arc, clad in complete armor, led Charles VII. up the exquisite nave of this cathedral. She had come from her village home to liberate France and to crown its king at Rheims. Loud hosannas resounded through those lofty aisles and that day marked the accomplishment of the heavenly mission of the Matchless Maid.

"In front of the great church in complete armor is the equestrian statue of Joan of Arc. Saxon and Norman and Dane and Hun and Vandal had come to that shrine to scoff and remained to pray, but at last German culture and German science and German civilization and German morality came in sight of this inestimable monument of the piety, the art and the glory of mediaeval Europe, and these twentieth century savages treated it as if it were only 'a scrap of paper.'"



## COMMERCIAL USES FOR PEAT\*

By Arthur J. Forward

Peat is still looked upon by many people in this country as something valueless, and to be got rid of in the easiest way possible. The method usually employed is to burn off the surface peat, laying the land beneath open to the operations of the agriculturist. In a recent case in Ontario on an appeal from a Court of Revision as to assessment of peat lands, a professor in an agricultural college is reported to have testified that the lands in question were absolutely worthless for agriculture unless the water was drained out down to the clay. If the property was drained down to the clay the peat could be burned off, leaving land suitable for agriculture.

There can be no quarrel with the decision of the Court lowering the assessment, nor with the statement as to drainage. But serious exception can and ought to be taken to the suggestion of burning off the peat to get rid of it.

Because the peat bogs cannot at the present moment be turned to practical account, it is assumed that their destruction is of no significance.

The economic results which can be obtained through intelligent development of our great peat areas are however important. Assuming that a given area of 100 acres is covered to an average depth of 5 ft. with peat adapted to the manufacture of fuel, this would yield about 100,000 tons of fuel, worth at \$3.00 per ton, \$300,000. It would furnish sufficient fuel to supply 100 families for 50 years, allowing 20 tons per annum to each family, or if burned in gas producers would supply a power plant of 400 h.p. with fuel for 50 years of 300 ten hour days per annum. And if proper methods were observed, there would be left at the close of the operations, 100 acres of highly valuable agricultural lands in place of a barren moor of the same extent. Large areas of the best lands in Holland have been created by reclamation of the moors.

By burning off the peat as suggested it is true that some fertilizing effect might be obtained from the deposit of peat ash on the clay. But apart altogether from any value the peat itself may have, the valuable results obtained by mechanical admixture of a layer of peat with the top clay soil, as practised so successfully in Holland and elsewhere is entirely lost. The result obtained by such method is the addition of a few acres of heavy and hard working soil to the farming area, where by proper treatment soil of the highest fertility and physical qualities would be secured. The value of saving a part of the peat to enrich and enlighten the heavy underlying clays is so well appreciated in Holland and elsewhere in Europe that laws have been framed requiring the operators of fuel plants to leave a foot or more of peat on the bottom of the bog.

Canada has 37,000 square miles (23,680,000 acres) of known peat bogs, but these form probably but a small fraction of the total, constituting a potential national asset of enormous value.

Where do we stand at the present time in relation to any extensive development of our peat bogs? Have we not reached a point where it is desirable that there should be some kind of a stocktaking of our peat resources, and of the means at our disposal of utilizing them to economic advantage?

The outstanding fact in relation to the industry is that what is known as "machine made peat fuel," is now being made commercially in large quantities in Europe, and a commencement has been made on this continent.

The great drawback is the shortness of the working season. But even this handicap has not prevented successful operation in Europe, and it may be definitely accepted at the present time that no economical method of overcoming the difficulty has yet been devised, or is even in sight. We will reach definite results soonest and with least outlay and loss by facing this fact.

A further development which may be regarded as having fairly reached the commercial stage is the application of peat fuel manufactured by the "open air" process to use in gas producers for the production of power, either with or without recovery of by-products.

The results obtained at the government fuel testing station in Ottawa afford a conclusive demonstration that provided a sufficient supply of peat fuel is available at a cost not to exceed say \$2.00 a ton at the plant, a very efficient and cheap production of power is obtainable.

At Pontedera, Italy, with the production and sale of electric power from peat gas there is being combined the manufacture of sulphate of ammonia as a by-product. This is a product for which the market is practically unlimited, and always increasing, with prices in the vicinity of \$60 to \$70 a ton. Some of the American bogs are rich in nitrogen and apparently well adapted for production of sulphate of ammonia.

Then we have the production of moss litter which is in Holland especially an important business in a stable position. Given a suitable bog, and the right conditions as to market, transportation, etc., there seems no reason why this business should not materially increase on this continent. The use of peat in connection with the manufacture of chemical fertilizers, as a filler, is an established fact.

Last but not least there is the agricultural development of peat lands. It is a matter which must become of great interest in Canada, and is already attracting much attention in the United States. In the Canadian Northwest are enormous areas of bog land which from insufficient depth or character of the peat are unsuitable for production of fuel or moss litter. With proper drainage and intelligent treatment these waste areas will become garden spots of high fertility and productiveness. The utilization of the vast peat areas will eventually not only serve to populate the country, but is likely to have a directly beneficial climatic effect.

Outside of the field of activity thus outlined there is a debatable ground of various operations for the utilization of peat which is still in the realm of theory and speculation.

The attempts to express the water from peat mechanically, to dry it by artificial heat, to make peat briquettes which shall have a density and a fuel value approaching that of good coal, to produce peat coke, etc., have absorbed millions of dollars of capital without practical commercial results.

Paper making from peat fibre has not yet proven of value, and so long as we possess enormous quantities of available spruce and other timbers, does not appear likely to make much headway in this country.

We have then as practical avenues of immediate commercial development:

(1) The manufacture of "machine peat fuel" made by the "open air" method with adoption of mechanical appliances superior to those in use in Europe.

(2) The production of power from peat burned in gas producers.

(3) Manufacture of sulphate of ammonia and incidental by-products.

(4) Manufacture of moss litter.

\*From Journal Canadian Peat Society.



(5) Utilization of peat in the production of chemical fertilizers.

(6) Agricultural development of peat lands; and probably a number of applications of peat of minor importance.

The development and improvement of the machinery necessary for all these purposes, as well as the carrying on of actual operations, affords ample scope for the legitimate investment of private capital, but there is absolutely no room in the peat industry for the professional promoter.

It is only by concerted and intelligent effort directed to the special development best adapted to each particular bog that the best results for the public can be obtained from exploitation of peat bogs, and for the people who invest their money in the work of development as well.

Much has been heard in recent years as to the depletion of the coal areas of the continent. Wood is fast disappearing as a fuel. The intelligent development of the fuel and other resources latent in our vast peat bogs may therefore be regarded as a measure of practical conservation, provided the methods of development followed are such as to secure the highest economic return from every bog utilized taking into account its particular character and situation.

#### ENTER THE CANADIANS.

The "Times," London, had the following in its editorial column, October 16, 1914:

On Wednesday the great fleet of liners carrying the Canadians arrived at Plymouth. This is the first answer given in Europe to Germany's egregious delusion that the Dominions would not rally to England in this war. But it is only the first. Canada has already taken steps to raise 60,000 men for the front. And Canada does not stand alone in her conviction that this war is hers as well as ours, and that she is fighting for her own rights and liberties as truly as ourselves. With one accord the Dominions have grasped the same fact, each for itself. One and all they have seen instinctively the real meaning of this conflict to us and to them. They know what the triumph of German militarism would signify to the cause of freedom and of progress, whose traditions are in their bones and in their blood. By a long exercise of perfidy and corruption while they feigned to be at peace with us, the Germans have contrived to give the forces of the South African Union occupation for the present at home. But the alacrity with which the Dutch people and their chosen leaders, temporal and spiritual, have rallied to the Government in the work of suppressing rebellion, must have disappointed German hopes as bitterly as would the dispatch of a contingent to fight in Europe. The Australians and the New Zealanders have already drawn the sword in the good cause, and have added to the Empire territories where Germany had planted her flag. The Australians have offered three contingents for European service, and New Zealand has shown herself equally anxious to see her sons at the front. That, as a leading Australian paper has said, is the refutation they give the German slander that the British Dominions "dread the yoke." They tell the German diplomatists and statesmen that this yoke has been evolved from the Teutonic imagination, but that they know of another yoke which all lovers of liberty abhor. It is to be seen in the colonial rule of Germany, and it has served as a sufficient illustration of German political methods to them. There are plenty of good citizens with German blood in the Dominions, and the peoples of those great free na-

tions have no ill-feeling against the race, from which this valuable element in their populations has come. Colonel Hughes made that point in his stirring address to the men who have now reached our shores. "Your aim," he said, "is to overthrow tyranny and aggrandizement." When free men from the Dominions stand side by side with the British troops "the Prussian autocracy will realize the gigantic power of liberty."

The thousands of these free men who have come amongst us, and the thousands more who are to follow them, have abandoned their homes and their businesses to teach "Prussian autocracy" that lesson. All England, all the Empire, shares the Canadian Minister's confidence that the soldiers of the "old Dominion" will give "a splendid account of themselves for King and country." We have known them before, and we know that they indeed "come from the right breed." If they did not, they would not have flocked of their own free will to the flag, as they have done, and as they are still doing with unabated ardor. We remember their work and the work of their brothers from Australia and from New Zealand in South Africa. There, for the first time, the troops of the daughter nations proved their valor and their skill in a common Imperial enterprise. Now they are about to prove their soldiership for the first time in a great European war. We welcome their assistance with gratitude and with pride. We welcome it for the addition which it brings to our numbers in the field, and for the exceptionally fine quality of the troops which it gives us. We are deeply sensible of its high military worth. But we welcome it far more for the incalculable moral support which it lends us in this great struggle of principles that conflict and that cannot be reconciled. The immediate answer, not only of the Governments of the Dominions, but of the masses of their peoples, to the call to arms is a supreme proof of the moral unity of the British Empire—that unity which German statesmen and German thinkers had been rash enough and ignorant enough to disbelieve and to deny. Our enemies thought that a war would divide us. They have been foolish enough to utter their thoughts and even to base their calculations upon these vain imaginings. All of us, whether at home or beyond the seas, knew that nothing would do so much as war to reveal our real unity and to foster it. We have been right, as we were sure we would be right. The coming of the Colonial troops is the proof that the peoples of this Empire understand each other better than all the spies and investigators whom Germany has sent out to study them.

The troops from Canada and the other Dominions are as fine material as any soldier in the world could wish to lead. The mere fact that they have volunteered for the cause is convincing evidence of their spirit. They are for the most part men of superior intelligence and education. They are used to the hard life of the settler and they are masters of all the arts with which he carries on his daily struggle with nature. They can shoot and ride. They can care for their horses and cook for themselves. They have the initiative, the quickness, and the decision which belong to the dwellers in the wilderness, and at the same time they love and trust their officers. They are particularly pleased to serve under Sir John French, who won their admiration in the Boer War. We well believe that they are the kind of men who, with such a leader, will go anywhere and do anything. But it is not only men who are needed in so great a contest, and it is not only men that the Dominions are sending us. Canada is dispatching her soldiers armed and equipped at her cost. She is supply-



ing us with a million bags of flour—a truly munificent gift. Alberta tenders us some 9,000 tons of oats. Mr. Ames, the chairman of the Montreal branch of the National Patriotic Fund, reports that the Western Provinces, Manitoba, Saskatchewan, Alberta and British Columbia, may be expected to contribute a million dollars for patriotic purposes and another million for the relief of unemployment and distress. These are but examples of the contributions in kind and in money which we hear of from the Dominions for the common cause. We are deeply grateful for them—grateful for their intrinsic value, but grateful most of all for the splendid spirit of Imperial Union, of loyalty, unshaken and unshakable, to the common King, the common flag, to those traditions and the ideals of a thousand years of which King and flag are the honored symbols and defenders.

### HEDLEY GOLD MINING COMPANY'S NEW POWER SYSTEM.

On June 1 of the current year the Journal included in its special correspondence the following information relating to progress at Hedley, in Similkameen district, British Columbia:

"The dam across Similkameen River in connection with the Hedley Gold Mining Company's new hydro-electric power system, for which the directors some time ago made an appropriation of \$200,000, is now nearly completed. The erection of this dam was commenced late last autumn, and now all that remains to be done is a small portion of the upstream aprons, which work must be deferred until the spring freshets in the river shall have passed. The ditch and flume line are now having attention, and the work on these is well advanced, both in clearing and grading the line, and in preparing timbers for the flume. Meanwhile production of ore at the mine, and its reduction in the company's 40-stamp mill are being continued as usual."

Recently the "Hedley Gazette" published the following report of progress and particulars of the new power plant:

"After discussing the subject of the recently declared quarterly dividend, the manager of the company, Mr. Gomer P. Jones, pointed out that not only was the plant running at full capacity, but also the company's policy of expansion, including the mine workings, the stamp-mill, and the power plant, was being steadily pursued, and it would be carried to its completion irrespective of financial conditions outside this district.

"Construction and equipment of the new power system and plant are being pushed forward on similar steady, cautious lines as those which have always characterized the company's activities in the past. Since last April construction work on the flume has been carried on without interruption, in spite of much difficulty experienced in getting prompt delivery of lumber, and Mr. Jones is authority for the statement that this work will be completed by the end of October. The transmission line is practically complete now, and, while the power house has yet to be built, and the machinery installed, the new plant will be running by the end of the year.

"The length of the flume from dam to forebay is 15,000 ft. The forebay is a large tank—60 by 20 by 25 ft.—and its purpose is to regulate the flow of water under variable conditions. From the forebay the

water will flow into the power house, which will be equipped with S. Morgan Smith twin turbines, operating in a Morgan Smith penstock and connected to a Canadian Westinghouse generator capable of generating 1,800 h.p. normally and running up to a maximum of 2,100 h.p. or more. From the generator the current will be transmitted over a line of No. 2-0 B. & S. 7-strand copper cable about two miles to the power house at the mill, where it will operate the two 400 h.p. motors running the compressors. The old compressor will be run by a step ring motor, installed by the Canadian General Electric Co., while the engine will be direct driven by a synchronous motor from the same company. The new compressor, for which excavations are being made, is an Ingersoll-Rand 150 r.p.m., 2,000 ft. capacity, machine. This, together with the old compressor will give a total effective air supply of 4,000 cu. ft. per min., which will be ample for all present needs and probably for those of some time to come."

It may be added that in 1912 the Hedley Co. mined and crushed 70,455 tons of ore of an average assay value of \$11.19 a ton. The value of the gold recovered was \$748,133.14, and the net profits for the year \$385,880. For the calendar year 1913 the corresponding figures were: Tons of ore milled, 70,796; average assay value, \$12.03 a ton; total value of gold recovered, \$802,330.40; net profits for year, 405,254.89. The manager reported that the reserve tonnage of ore that can be mined and milled at a profit was estimated to be 413,000 tons; estimated average value, \$10 a ton. He added: "We hope, however, to make about the same earnings per ton in 1914 as in 1913, through cheaper power and possibly a slight increase in tonnage. There is also the chance that drifting and stopping may show the ore to be equal in value to the average run of the mine, which has been about \$12 a ton."

### UNDERGROUND TRANSPORTATION.

Mr. O. P. Hood in a paper prepared for the October meeting of the American Institute of Mining Engineers says:

"None of the methods now in use for the transportation of materials underground is entirely free from more or less serious objection. The great flexibility, ease of control and economy of operation of electric tramming are accompanied by the serious menace of a trolley wire distributing system.

"As the gasoline locomotive has even greater flexibility of application and requires no similar dangerous distributing system, it might be considered a safety device which would make possible the elimination of the dangerous trolley system were it not possessed of other objectionable qualities peculiar to itself. It is found that the exhaust gases from the engine may be injurious to the health of those breathing the air in which the locomotive has been operating. While electric shock may kill the individual who makes contact with uninsulated parts, the gasoline engine may be detrimental to the health of all those who have to work within the atmosphere corrupted by exhaust gases. The degree of pollution measures the magnitude of the menace. This may be negligible at times, but with careless operation it becomes serious. The exhaust gases from an engine are composed of nitrogen, a little free oxygen, hydrocarbons, hydrogen, carbon monoxide and carbon dioxide, the last two being considered dangerous."



## THE PEAT-MAKING INDUSTRY OF NORTHERN HOLLAND

According to a U. S. Consular report peat fuel is made in Holland from two sorts of ground, the Sphagnum peat beds being found on the moorlands, while the sedge and grass peat beds are situated in marshy bogs. The peat of the country is formed from decayed vegetable matter, such as mosses, grass, heather and various other sorts of plants. The grass peat bogs extend to a depth so far beneath the normal ground water level that it is necessary to drain the water off by ditches. The Sphagnum bogs are above the normal water level of the canals.

It is quite certain that the earliest inhabitants of the country from remote times had to burn peat, especially in some sections of the country. The peat industry here, therefore, dates from many centuries ago. In the neighborhood of cities and villages, the industry grew more rapidly than in country districts on account of the greater demand and small cost of transportation. Later, waterways were made to reach the more distant peat beds.

Out of the peat bogs short peat was obtained, also known as "sponturf." The process of excavating the peat is about as follows: A small stretch of ground on which to spread the peat so that it will dry is levelled off and a layer of straw spread over it. The digger with a spade forms the loose, wet peat into square, flat pieces. When the peat is well mixed, it is taken out of the basin and laid on the straw-covered ground, which absorbs the superfluous water. The sheet, when sufficiently dried, is cut with a knife or spade into blocks about the size of an ordinary brick. When sufficiently sun-dried, the blocks are stacked into piles. Later the blocks are piled into larger stacks. In this manner the peat is changed around till that which was at the bottom of the original piles is on top of the stack. The stacking of peat is done usually by women. The wet peat is laid in long rows flat on the ground, so that in a short time the sun has sufficiently dried it to form a hard crust on the upper side. Then another row is laid on top of the first, and when this is dried, another, and so on, till 11 rows have been laid. It is so piled up that the wind circulates freely around each piece.

The time for digging the peat is from March 25th till the end of June. The lighter sorts are made during the whole year. The owners of peat fields erect houses which are rented to the workmen and their families. In many instances a plot of ground goes with each house, which enables the workman to dig and dry his own peat free of cost. The wages of workmen who cut the peat range from 2 to 3 guldens (80c. to \$1.20) per day, while the women are paid the equivalent of 25 to 32 cents per day. During the cutting season many workmen from neighboring districts are employed.

Machines are very little used in the preparation of short peat. In the peat bogs of North Holland machines are here and there used for pulping and kneading. In some parts of the country the peat bogs are often rented to the workmen or contractors. When this is the case, the owner retains possession of the land after the peat has been removed. These peat fields can not be worked without first obtaining a concession from the Government. A certain sum must also be paid for the building and maintenance of the dikes around the

polders. In Friesland the owners of ground, where short peat is produced, are obliged to make a deposit in money. After the peat has been removed and the ground brought under cultivation the amount of the deposit is returned to the owner.

Besides what is consumed for household purposes, the amount used in factories is not unimportant. In brick factories situated along rivers large quantities are used as fuel. In strawboard and potato-flour factories, especially those situated in the northern part of the country, it is used in great quantities. Large quantities of heavy peat are also shipped from Drente to Friesland and the northern cities. Light peat is also shipped in great quantities to Amsterdam and The Hague, where it is extensively used for lighting fires.

In some peat fields, the upper layer of peat to a depth of one-half to one and a half yards, is of a light brown color. This peat is very porous and light in weight. Seen from the outside it looks like great square sponges. From this sort of peat, known as "bolsterturf," peat dust, which is shipped to all parts of the world, is produced. After being ground, it is packed in 200-lb. bales. Peat dust is much used for bedding in stables. When used for that purpose its absorbing qualities are such that it makes an excellent fertilizer. It is also extensively used in nurseries. Peat dust factories are to be found in Klazinaveen, Hoogeveen, Beilen, Dedemsvaart, Friezenveen and Bergentheim.

The yearly production of peat dust in Holland amounts to 200,000 tons. In Germany the railways allow a discount of 30 per cent. on the transportation charges, but as this does not apply to shipments from Holland, the Dutch shippers are unable to compete with Germany in that country.

On the border of the Province of Groningen the use of peat-making machines is rapidly growing. In the neighborhood of Emmerecompascuum some 50 machines have been introduced. These are used only for macerating the peat. The wet mass is spread out on the field and worked the same as "short turf." In Hoogeveen and Vroomshoop there are factories where machinery is also used.

The undeveloped districts in which peat is found occupy but a small portion of the waste land of the whole country. There are yet about 35,250 hectares which are still undeveloped. In the Province of Drente alone there still remain about 21,340 hectares (hectare equals 2.47 acres) which have not been touched. It must not be forgotten either that each year there are about 10,000 families who find employment in the peat fields. Thousands of workmen also find employment in sanding the land and preparing it for cultivation after the peat has been removed.

By the judicious use of artificial fertilizers such ground is soon brought into a high state of cultivation. The excavations caused by the removal of the peat are called valleys and are very fertile. As soon as these valleys are ready to be worked they are taken possession of by the farmers.

As soon as the growing of grain and the raising of potatoes is sufficiently developed, factories for the manufacture of strawboard and potato flour spring up where formerly all was waste land. Many prosperous towns and cities, such as Veendam, Wildervank, Oude and Nieuwe Pekela, Nieuw-Buinen, Stadskanaal, Emmerecompascuum, Klazinaveen, Erica, Nieuw Amsterdam, Dedemsvaart, Hoogeveen, etc., owe their existence and prosperity to the peat industry.



By using the canals for the transportation of peat, hundreds of boatmen and their families find a means of livelihood. Aside from a certain amount of freight which is shipped by rail, there are yearly between 5,000,000 and 6,000,000 cubic meters (cubic meter equals 35.314 cubic ft.) of boat space necessary. When one takes into consideration the fact that these boats have a capacity of from 50 to 250 cubic meters, some idea of the extent of the industry may be formed when it is stated that about 48,000 boatloads are shipped yearly.

## FATAL ACCIDENTS IN BRITISH COLUMBIA MINES

The statement of the coal and metal mine fatalities in British Columbia during the third quarter of the current calendar year has been issued by the Provincial Department of Mines. It has been compiled by the Chief Inspector of Mines, Mr. Thomas Graham. The following is a summary of the return:

### Coal Mine Fatalities.

There were five men killed during the third quarter of 1914, against four during the corresponding period of 1913. The figures for the expired months of this year and the corresponding months of last year are: Killed during January-September, 1914, 13; during the same months of 1913, as under:

	1914.	1913.
January. . . . .	1	2
February. . . . .	4	1
March. . . . .	2	4
April. . . . .	1	9
May. . . . .	..	2
June. . . . .	..	1
July. . . . .	1	4
August. . . . .	3	..
September. . . . .	1	..
Totals. . . . .	13	23

The collieries at which the fatalities occurred in 1914 were: At C.P.R. Co.'s colliery, Hosmer, Crow's Nest Pass, 3; at Crow's Nest Pass Coal Co.'s colliery, Michel, 1; at Canadian Collieries (Dunsmuir) Ltd.'s colliery, Cumberland, V.I., 5; at Western Fuel Co.'s colliery, Nanaimo, V.I., 4; total 13.

Ten of the fatalities are placed under the heading "Killed underground," two under "Killed in shafts," and one under "Killed on surface." The causes of death underground were: By falls of roof and rock, 2; falls of coal, 1; mine cars and haulage, 2; suffocation in fine coal, 2; returning on unexploded shot, 2; electricity, 1. Of those in shafts, one was "by cage" and the other "by falling off bucket." That on the surface was "by coke-oven larry."

### Metal Mine Fatalities.

There were five men killed in and about the metal mines of the Province during the third quarter of this year as compared with three in the corresponding period of 1913. For the nine months—January-September—of the two years the numbers are 19 for this year, against 10 for last year, as under:

	1914.	1913.
January. . . . .	1	1
February. . . . .	..	..
March. . . . .	4	2
April. . . . .	1	..
May. . . . .	3	1
June. . . . .	5	..
July. . . . .	5	3

August. . . . .	3
September. . . . .	..
Totals . . . . .	19 10

The mines at which the fatalities occurred in 1914 were: Rambler-Cariboo, Sloean, 1; Golden Horn, Ymir, 1; Centre Star-War Eagle, Rossland, 2; Granby, Phoenix, 5; Rawhide, Phoenix, 2; Jewel, near Greenwood, 2; Nickel Plate, Hedley, 1; Britannia, Vancouver, 2; Hidden Creek, Granby Bay, 3; total, 19.

The causes of death were: Underground—Picking or drilling into unexplored powder, 1; premature blasts, 5; gassing or suffocation from powder fumes, 3; falling down winze, 1; falls of ground, 3; mine cars and haulage, 1; returning on unexploded shot, 1; total, 15. On surface—Slide of rock off quarry face, 3; aerial tramway, 1; total, 4. Grand total for 1914, 19.

## BRYCE ON GERMAN METHODS.

Viseount James Bryce says in the New York Times: "The present war has had some unexpected consequences. It has called the attention of the world outside of Germany to some amazing doctrines proclaimed there, which will strike at the root of all international morality as well as of all international law, and which threaten a return to primitive savagery, when every tribe was wont to plunder and massacre its neighbors. "These doctrines may be found set forth in the widely circulated book of Gen. von Bernhardt, entitled "Germany and the Next War," published in 1911, and professing to be mainly based on the teachings of the famous professor of history, Heinrich van Treitschke. To readers in other countries, and I trust to most readers in Germany also, they will appear to be an outburst of militarism run mad, a product of a brain intoxicated by love of war and by superheated national self-consciousness.

"They would have deserved little notice, much less refutation, but for one deplorable fact, viz., that action has recently been taken by the Government of a great nation (though, as we hope and trust, without the approval of that nation) which is consonant with them and seems to imply belief in their soundness.

"This fact is the conduct of the German Imperial Government in the violation of the neutrality of Belgium, which Prussia, as well as Great Britain and France, had solemnly guaranteed by treaty (made in 1839 and renewed in 1870); in invading Belgium when she refused to allow her armies to pass, although France, the other belligerent, had explicitly promised not to enter Belgium; and in treating Belgian cities and people against whom she had no cause of quarrel with a harshness unprecedented in the history of modern European warfare.

"What are these doctrines? I do not for a moment attribute them to the learned class in Germany, for whom I have profound respect, recognizing their immense services to science and learning; nor to the bulk of the civil administration, a body whose capacity and uprightness are known to all the world, and least of all to the German people generally. That the latter hold no such views appears from Bernhardt's own words, for he repeatedly complains of and deprecates the pacific tendencies of his fellow-countrymen.

"Nevertheless, the fact that the action referred to, which these doctrines seem to have prompted, and which cannot be defended except by them, has been actually taken and has thus brought into this war Great Britain, whose interests and feelings made her desire peace, renders it proper to call attention to them and to all that they involve."



# MICROSCOPIC TESTS ON OPAQUE MINERALS\*

By Everend L. Bruce.

The determination of opaque minerals when occurring as small grains in rocks, or when in intimate association in ores, is one of the difficult and uncertain problems of mineralogy. The translucent and transparent minerals yield to well known microscopic methods, but thus far few such tests have been devised for the opaque minerals. Considerable work has been done by different investigators, largely, however, with the purpose of ascertaining the paragenesis of known minerals rather than determining unknown ones. It is the purpose of this paper to combine the various tests devised by those who have worked along this line with a few additional methods that seem applicable to the problem, in an attempt to construct at least a partial determinative scheme.

Among the early articles on the subject is one by William Campbell (*Economic Geology*, Vol. 2, pp. 350-366) giving distinguishing characteristics for the minerals magnetite, chalcopyrite, pentlandite, pyrite and pyrrhotite.

Campbell and Knight used the method of polishing and etching on various Cobalt ores, but no definite determinative tests are recorded.

Bastin, in his paper on metasomatism in sulphide enrichment, records the fact that polybasite with strong  $\text{HNO}_3$  is not etched so readily as chalcocite, but slowly exhibits a yellowish brown color with a slight iridescence in places. Chalcopyrite similarly treated shows a faint peacock tarnish.

The most detailed work on the identification of opaque minerals is that of F. C. Lincoln. He has examined the gold ores and constructed a scheme for the determination of most of the several gold minerals.

Etching by means of an electric current produced by a small platinum triangle has been tried by Beijerinck with the following results: Cassiterite, deposit of black metallic tin; chalcopyrite, becomes black; pyrite and pyrrhotite, not affected.

In constructing a scheme from these tests and from others that were devised, the object aimed at was the determination of minute grains of mineral. This was not always successfully done. Some of the results depend on chemical reactions which it is as yet impossible to localize, and to that extent the results obtained are uncertain. A brief statement of the methods of preparation of the specimens and of obtaining the special results will be followed by a summary in schematic form.

**Preparation of the Specimen.**—The polishing of the mineral is fully described by Campbell in *Economic Geology*, Vol. 1, p. 751, but for completeness, a brief summary is given here. A fairly flat specimen is chosen if possible, and this is ground to a plane surface on a horizontally rotating iron lap, armed with medium-grade carborundum. After a thorough washing, the specimen is treated on a copper lap with No. 100 emery until the grooves of the coarse grinding are erased. This is followed by No. 200 emery, until the scratches of the No. 100 powder disappear. In all cases the specimen is rotated to prevent unequal effect. After washing and drying, the surface is polished on three grades of polishing paper, Nos. 0, 00, 000, mounted either on boards, the motion being produced by hand, or on wooden laps rotated as before. The grinding in

each case is continued until the scratches from the previous treatment are removed. The orientation of the specimen in each succeeding treatment should be at right angles to that in the previous one, so that the scratches of the finer paper will be across those of the coarser. After polishing with the finest paper, a lap covered with broadcloth saturated with rouge and water is used for the finishing process. By this means a high polish can be obtained.

**Instruments.**—The microscope used for this investigation was one with which both inclined and vertical illumination could be obtained. Inclined illumination was secured by a small parabolic mirror attached to the objective; vertical illumination by a movable glass disc in the barrel of the microscope. The source of light for ordinary work was a Welsbach lamp, the light being focussed by a plano-convex lens. For some minerals the light was filtered through a flask of copper sulphate solution, replacing the lens; by this means, light containing no yellow rays can be obtained. For applying chemicals to the polished surface small glass tubes drawn to a fine point are useful. For physical tests, any small fine-pointed instrument can be used.

**Methods.**—The mineral, prepared as above described, was first examined for color and appearance. For this purpose obliquely incident light gives the best results. Following this, one large specimen was broken into several smaller ones, some of which were treated further, while one was kept for reference. Etching was first tried with strong cold  $\text{HCl}$ , at half-minute intervals, or less, if much action took place. If unattacked after a reasonable time, strong cold nitric acid was substituted for the hydrochloric. Finally, aquaregia was used with substances that resisted both single acids.

In the case of minerals that behaved in the same manner under etching special chemical or physical tests were tried. In chemical tests, the grain to be tested was brought into focus under a fairly low-power objective with an acid capable of etching it. After the action had continued for a short time, a drop of a reagent producing characteristic reactions was added. Under the microscope only very small quantities are necessary, and, with care, rather small grains, can be thus tested. The chief reactions employed are the following:

1. Iron. The grain touched with freshly prepared mixture of potassium ferrocyanide and acid becomes deep blue if iron be present.

2. Nickel. The mineral is treated with a mixture of  $\text{HNO}_3$  and tartaric acids. After evaporation, when touched with a solution of dimethylgloxime freshly made ammoniacal, a brilliant red is obtained from minerals carrying nickel.

3. Copper. In the presence of copper, a mixture of  $\text{HNO}_3$  and potassium ferrocyanide solution gives a deep red. If iron also be present, this is followed by green.

4. Manganese. Most manganese minerals are attacked by  $\text{HCl}$  with production of a deep brown solution which becomes colorless on addition of hydrogen peroxide.

5. Silver. The mineral is treated with nitric acid. Addition of hydrochloric produces a white precipitate. Also true of lead and mercury minerals.

\*Extracts from article published in *School of Mines Quarterly*, Vol. xxxv., No. 3, 1914.



6. Bismuth. The mineral is touched with nitric acid followed, after drying, by hydrochloric. A little water will then produce a white precipitate.

**Physical Tests.**—In a few cases, streak and hardness are useful. These tests can be made with a needle point.

Besides the above, a few other tests were tried. Deposition of silver from weak silver sulphate solutions by certain minerals may possibly be useful as a criterion. An experiment was tried with marcasite and pyrite in a ten per cent. solution. What seemed to be a dendritic growth of silver formed on the marcasite after long immersion, while the pyrite remained bright and unchanged. Further tests with variation of temperature and concentration are necessary, however. The rate of attack in the process of etching is also sometimes a valuable aid in identification.

#### Table for Determination of Minerals.

The scheme outlined below depends for its major division on the color of the polished mineral. In each color division, subdivisions are made by etching tests. Special behavior of different minerals makes further differentiation possible in many cases.

##### 1. Mineral by Inclined Illumination is Yellow.

###### A. Etched by HCl.

Pyrrhotite. Bronze yellow. Surface rough. Reacts for Fe.

###### B. Etched by $\text{HNO}_3$ , not by HCl.

###### (a) Without noticeable tarnish or deposit.

Pyrite. Pale yellow. Slightly rough. Reacts for Fe.

Marcasite. Pale yellow. Slightly rough. Reacts for Fe. Precipitates Ag(?).

Millerite. Slightly rough. Reacts for Ni.

###### (b) With tarnish.

Chalcopyrite. Deep yellow. Rough. Reacts for Fe and Cu. Iridescent tarnish.

###### C. Not attacked by single acids.

Gold. Deep yellow. Smooth. Amalgamates with Hg.

##### II. Mineral is White.

###### A. Etched by HCl.

###### B. Etched by $\text{HNO}_3$ .

###### (a) With no tarnish or deposit.

Smaltite. Rough with bright facets. Gives Ni test.

Arsenopyrite. Rough with bright facets. Becomes gray with reddish spots. Reacts for Fe, not for Ni.

Leucopyrite. White. Very rough. Reacts for Fe.

Silver. Smooth. Reacts for Ag.

Bismuth. Smooth. Reacts for Bi.

###### (b) With deposit.

Arsenic. Chalky white deposit.

Antimony. Chalky white deposit.

###### C. Unattacked by single cold acids.

Cobaltite. Slightly rough. Etched by  $\text{HNO}_3$ .

Niccolite. Slightly rough with reddish tinge.

Treated with aqua regia reacts for Ni.

##### III. Mineral is Black or Grayish Black.

###### A. Etched by HCl.

Magnetite. Shows interesting parting planes. Etches easily. Fe reaction.

Franklinite. Fairly smooth. Etches less readily than magnetite.

Ilmenite. Fairly smooth. Etches very slowly.

Hematite. Steel gray. Smooth. Red streak.

Manganite. Dull black. Brown solution.

Psilomelane. Brown and black areas. Brown solution.

Braunite. Black. Etches to bluish black. Brown solution.

Alabandite. Smooth grayish black. Very easily attacked (40 sec.).

Pyrolusite. Black fibrous surface. Soft. Brown solution.

###### B. Etched by $\text{HNO}_3$ , not by HCl.

###### (a) Without tarnish.

Enargite. Dull grayish black. Etches to fibrous structure. Cu test.

Argentite. Smooth dull black. Ag test. Sectile.

Stephanite. Smooth dull black. Ag test.

###### (b) With a tarnish.

Chalcocite. Smooth black. Etched to a bluish tarnish, later becoming peacock colors.

Bornite. Pitted. Purple color. Etches to a peacock tarnish. Reacts for both Fe and Cu.

###### (c) With a deposit.

Galena. Smooth black. Etches easily, with a yellow deposit.

Bournonite. Smooth dull black. Etches easily, with yellowish opalescent deposit. Cu test.

Sibnite. Smooth dull black. Etches fairly slowly to a fibrous structure with a chalky deposit.

Tetrahedrite. Smooth. Bluish black. Etches with an opalescent deposit. Reacts for Cu.

###### C. Unattacked by single acids.

Molybdenite.

Chromite.

Cassiterite. Black deposit by electric etching.

Columbite.

The table as presented is by no means complete, and some of the minerals treated cannot be absolutely determined by the tests recorded, but it is believed that the compilation of what is known will be of distinct advantage.

#### BAILEY COBALT.

According to statements given to the press, Bailey Cobalt Mines, Limited, will have another chance to develop its property and pay off its debts. For some time the affairs of the company have been out of the hands of the management, but now a scheme for reorganization is under way.

The plan submitted to the shareholders of the company is that a new company be formed with a capital of \$600,000.

The total debts of the company amount to \$93,179, of which all but about \$2,390 are owed to E. A. Benson. Mr. Benson, who was former president of the company, had advanced \$90,789 and because of this the company was forced into liquidation.

The reports state that the committee appointed for investigation reports that there is 400,000 ounces of silver in the mine, worth roughly \$200,000, the net profit on which is estimated at \$150,000. The outstanding stock of the Bailey is \$5,250,000, and the committee propose that a new company, with a capital of \$600,000, take over the property and give Benson a mortgage for the full amount of his claim. Bailey shareholders will get one share of stock in the new company for every ten of old, which will account for \$425,000 of the proposed \$600,000 capital. The remaining \$175,000 will be sold to provide working capital.



## BOOK REVIEWS

**IRON ORES, THEIR OCCURRENCE, VALUATION AND CONTROL**—By Edwin C. Eckel—McGraw Hill Book Co., New York—For sale by Canadian Mining Journal, Book Department—Price \$4.00.

In this volume of 426 pages the author discusses the geological and technical relations of iron ores, and their more general relations to industrial conditions. Beginning with some consideration of the natural abundance and wide distribution of iron, the manner in which this disseminated iron is concentrated into workable ore deposits is discussed in considerable detail. The second section of the volume is devoted to discussion of the various factors affecting the value of iron ores, and the valuation of ore deposits.

The chapter headings are: The Industrial Status of Iron, Geological and Chemical Relations of Iron, Iron Minerals and their Relationships, Formations of Iron Ore Deposits, Sedimentary or Bedded Deposits, Replacements and Cavity Fillings, Alteration Deposits, Igneous Iron Deposits, Basal Factors in Ore Valuation, Prospecting and Tonnage Determinations, Mining Conditions and Costs, Furnace and Mill Requirements, Composition and Concentration of Iron Ores, Ore Prices, Profits and Markets, The Effect of Time on Valuation, Iron Ores of United States, The Lake Superior District, The Southern United States, Northeastern United States, Western United States, Newfoundland and Canada, West Indies, Mexico and Central America, South America, Europe, Asia, Africa, and Australia, The Extent of American Ore Reserves, Probable Duration of American Reserves, Ownership and Control of American Reserves, Iron Ore Reserves of the World, World competition in Iron and Steel, Questions of Public Policy, Questions of Private Policy.

As indicated by these chapter headings, Mr. Eckel has gathered together a great deal of matter pertaining to the iron ore industry.

**THE MINERAL INDUSTRY, ITS STATISTICS, TECHNOLOGY, AND TRADE DURING 1913**—Edited by G. A. Roush, published by McGraw Hill Book Co., New York—For sale by Canadian Mining Journal, Book Department.

This volume, the twenty-second of a series founded by Richard P. Rothwell, brings up to date the record of progress in mining and metallurgical industries. Production statistics have been used extensively.

The author has aimed, however, to make the volume not merely a record of productions, but also of progress. With this in view, the attempt has been made to combine the more important statistics from whatever source they may be gleaned, with such extracts from the current literature that have an important bearing on the subject in question, and sufficient discussion of the prevailing commercial conditions to show the trend of the financial side of the industry.

Mineral Industry long ago took its place as a standard reference annual. The present volume is up to standard.

**MODERN TUNNELING, WITH SPECIAL REFERENCE TO MINE AND WATER SUPPLY TUNNELS**—By D. W. Brunton and J. A. Davis—John Wiley & Sons, New York—For sale by Book Department, Canadian Mining Journal.

In this book the authors present up-to-date information concerning tunnel methods. The book is intended to supply useful data on methods and equipment that are proving safe, efficient and economical, and to make suggestions that may result in a saving to the mining

industry of life, energy and capital. Methods are not merely described, they are analyzed. Emphasis placed upon good points of equipment, and criticism of a constructive rather than a destructive nature is made.

The book is confined chiefly to tunnels and adits for mining purposes, such as drainage, transportation or development, but includes those which are used to carry water for power, irrigation or domestic use, in which the essential features are practically identical with mine tunnels.

The chapter headings are: Introduction, History of Tunnels, Modern Mining and Water Tunnels, Choice of Power for Tunnel Work, Air Compressors, Ventilation, Surface Equipment, Rock Drilling Machines, Haulage, Incidental Underground Equipment, Drilling Methods, Blasting, Methods of Mucking, Timbering, Safety, Cost, Bibliography Outline of Tunnel Data.

**UNIT CONSTRUCTION COSTS FROM THE NEW SMELTER OF THE ARIZONA COPPER CO., LTD.**—By E. Horton Jones—McGraw Hill Book Co.—For sale by Book Department, Canadian Mining Journal—Price \$2.00.

This is a work of a very unusual character, containing as it does the unit construction costs derived from the building of a large modern smelter recently completed.

The chapter headings are: Unit Costs, Comparative Costs, Composite Costs, Wage Scale, Raw Material Prices, and Description of Costs.

The paper was presented at the Salt Lake City meeting of the American Institute of Mining Engineers in 1914, and has been republished by special arrangement.

### HOLLINGER.

The statement of the Hollinger Gold Mines, Limited, for the four weeks' period ending October 7 shows gross profits of \$149,798, which is a smaller return from the working of the property than was reported in either of the two previous months, but still some \$50,000 in excess of the dividend requirements for that period. The Hollinger surplus is now in excess of \$1,100. The average value of the ore treated during the four weeks' period ending October 7 was \$13.54, which is a shade above the average for the present year. Owing to changes in the mill the tonnage treated fell slightly below the previous month. The failure in the power supply and other causes contributed to a temporary shutdown. Working costs during the month showed an increase because of the smaller tonnage treated. The general manager states in the report that the mine continues to yield satisfactory results.

No. 10 vein has been cut on the 200 ft. level, and No. 2 vein, south extension, has been reached by crosscut upon the 300 ft level.

No. 1 vein upon the 550 ft. level has been yielding high grade ore in the south drift.

The following statement shows in comparative form the result of Hollinger operations for the past 3 twenty-eight day periods:

	Oct. 7.	Sept. 9.	Aug. 12.
Gross profits .....	\$149,798.25	\$152,821.38	\$171,975
Current assets ...	601,477.78	555,099.65	514,221
Gold assets .....	103,737.65	190,425.23	309,297
Surplus. . . . .	1,100,755.00	1,043,957.01	981,135
Working cost ....	79,932.28	76,659.00	68,578
do per ton milled	4,408	3,866.00	4,167
Running time of, possible. . . . .	89%	96%	96%
Average value ...	\$13.54	\$12.41	\$15.46
Approx. extract ..	.....	93.01%	94.04%
Ore treated tons..	18,132	19,828	16,456



**NOVA SCOTIA STEEL CO.**

In an interview Mr. Thomas Cantley, general manager of the Nova Scotia Steel and Coal Co., explained the new work undertaken for the Militia Department. He said: "We have undertaken to produce for the Militia Department 200,000 shells for fifteen and eighteen pound field guns. All the steel which is being used in the manufacture of these shells will be furnished by the Nova Scotia Steel and Coal Co. The reason for this is that the Scotia company is the only plant in Canada which has a fluid compressor plant.

"At this plant we are forging the shell bodies and the steel discs which go inside of them. The finishing the shells has been split up into different contracts between ten different engineering firms. Three concerns in Montreal, two in Sherbrooke, one in Galt, one in Dundas, three in Toronto, and one in Kingston.

"These shells must be completed before the end of March, and we have guaranteed to turn out a certain number per month; our output at the present time is from 1,500 to 2,000 shell bodies per day.

"I think this but marks the initial stages of the work, for 200,000 shells would only mean enough ammunition for the British army for about one day."

Asked about business conditions, he said that he found them a little better. So far as the Scotia company was concerned there were some prospects of additional work, but the great bulk of the orders were at present pending, "but I think it will come out all right in a short time; just now, you know, it is a question of money," he added.

"The committee is now directly in communication with the War Office in London. We have here to-day with us a gentleman who was formerly superintendent of the Woolwich Arsenal. This gentleman, Mr. Carnegie, was taken from there by Hadfield's, the big armor plate people, at the time of the installation of their ordnance department for the making of shells, and he was responsible for their entire equipment.

"After getting through with them he engaged in private enterprise, and came out to this country three weeks ago, and almost by accident we learned that he was on his way out. Owing to his experience we asked authority to engage him as ordnance inspector to the committee, and we received the authority, and later engaged him. He is now doing some inspection work and will visit all these firms that hold contracts for the finishing of the shells periodically and give them pointers and suggest the most approved methods of doing the work, and we feel that his services will be well nigh invaluable and he has been engaged for three months on the authority of the Minister.

"He is going to spend two days at this plant looking over the forging of the shells here. I expect to remain here a portion of this week, after which I will go back again and take up the work. The Dominion Arsenal of Montreal is at present working day and night, Sundays and holidays, in order to keep up with the work."

**THE INTERCOLONIAL RAILWAY.**

"Railroad men have so many knocks that I want to throw one bouquet. The Intercolonial is operating an excellent service between St. John and Montreal, and no doubt other portions of the line are equally well served. You have the best class of sleeping and parlor car conductors it has been my good fortune to meet, and your dining car employees' food and service leave nothing to be desired."

An officer of the Canadian Government Railways received the above from a much traveled official of one of the most important railways across the border.

**U. S. COPPER SHIPPERS PROTEST.**

American copper shippers are protesting vigorously to Secretary of State Bryan against seizure of copper cargoes from the United States consigned to Italy.

The following telegram, signed jointly by American Smelting and Refining Co., American Metal Co., United Metals Selling Co. and Consolidated Metals Co., was despatched Oct. 28, to Secretary Bryan:

New York, Oct. 28, 1914.

To the Honorable, The Secretary of State,  
Washington, D.C.:

The undersigned, representing nearly 90 per cent. of the copper export trade of this country, have the honor to lay before you the following facts:

We learned yesterday by cable that the Italian steamers San Giovanni and Regina d'Italia have been seized by British authorities at Gibraltar because part of cargoes consist of copper shipped from this country. The San Giovanni has 450 tons belonging to American Smelting and Refining Co. and consigned in conformity with universal practice in the trade to order of that company at Genoa. The Regina d'Italia has 1,160 tons, of which 150 belong to the American Smelting and Refining Co., 200 to the American Metal Co., 410 to the Consolidated Metals Co. and 400 to the United Metals Selling Co., practically all being consigned in the usual course in the same way.

We are further advised this morning by shipping agents that the American line steamer Kroonland, flying the American flag and having on board 800 tons of copper belonging to the American Smelting and Refining Co., and 500 to the United Metals Selling Co., has also been seized and is detained at Gibraltar, the copper being consigned in usual course as in the other cases.

Moreover, we have just been notified by the New York agents of the Sicilian-American line that, for reasons which cannot be explained, it absolutely declines to ship any copper by its steamer San Giorgio, and this morning the Lloyd Sabaudo line has given notice of its refusal of a shipment of copper and cancellation of contract unless the name of an Italian consignee shall be given, together with a guarantee that the copper shall not be re-exported from Italy, which guarantee it is manifestly impossible for the American exporter to give.

These measures of interference with our commerce threaten to stop altogether the exportation of copper from the United States to Europe, and this means practically the stopping of the entire export business in that metal, except to England and France, since there is no demand for the American product outside of Europe. The stopping of the export trade would affect disastrously the copper mining industry throughout the West.

We beg leave respectfully to ask consideration of the facts above set forth and such representations and action by our Government as it may deem appropriate for the relief of the critical situation in which the industry we represent is now placed, and we shall be very grateful to be acquainted of the action taken by the department to that end.

(Signed)

American Smelting & Refining Co.  
The American Metal Co., Limited.  
United Metals Selling Co.  
Consolidated Metals Co.

**RIGHT OF WAY.**

A dividend of one per cent. on the paid up capital stock of the Right of Way Mines, Ltd., has been declared and is payable Nov. 16, 1914, on which date cheques will be mailed to shareholders of record Nov. 10, 1914.



## PERSONAL AND GENERAL

A meeting of the Toronto branch of the Canadian Mining Institute was held at the Engineers' Club, Saturday, Oct. 31. The following officers were elected for the ensuing year: Chairman, A. J. Young; secretary, R. E. Hore; executive committee, F. C. Loring, Dr. W. G. Miller, C. E. Smith, D. A. Dunlap, Jas. McEvoy, H. E. T. Haultain and J. P. MacGregor. The next meeting will be held Nov. 21.

Mr. Adolph Lewisohn has been elected president of the Kerr Lake Mining Co.

Mr. Cyril Knight, assistant Provincial Geologist of Ontario, has returned to Toronto after spending the season mapping pre-Cambrian areas north of Lake Huron.

Mr. A. G. Burrows, of the Ontario Bureau of Mines, has returned to Toronto after several months in field work in the Porcupine gold district.

Mr. W. G. Trethewey, discoverer of the Trethewey and Coniagas silver properties at Cobalt, has joined the airmen's corps for service in the British expeditionary force. Mr. Trethewey has been a liberal subscriber to war relief funds and has placed his yacht, on which he was cruising in the Mediterranean when the war broke out, at the disposal of the Admiralty.

Major R. W. Leonard, president of Coniagas Mines, Ltd., has contributed a further sum of \$6,000 to the Red Cross fund. He had previously contributed \$5,000.

Mr. C. A. Foster, of Haileybury, is going to the front from London, having obtained a lieutenant's commission.

Mr. Thomas Cantley, of the Nova Scotia Steel Co., has been gazetted an honorary colonel.

Mr. Neil R. MacDonald is in England with the Canadian contingent.

Mr. W. H. Aldridge, of New York City, formerly managing director of the Consolidated Mining and Smelting Company of Canada, Ltd., with headquarters at Trail, B.C., was recently appointed a member of the executive of the American Mine Safety Association.

Mr. T. Walter Beam, who had during the seasons of 1913 and 1914 been in charge of the exploratory work with diamond drills of the New York Syndicate No. 2 at Hedley, Similkameen, B.C., was presented with an engraved gold-mounted cigar case before leaving Hedley last month to spend the winter at his home in Denver, Colorado.

Mr. W. B. Bishop, superintendent of the Granby Consolidated Co.'s copper smelting works at Grand Forks, Boundary district, B.C., has gone to the company's new smelter at Anyox, Observatory inlet, to take charge of copper smelting operations there during the absence for a time of Mr. T. Wakely A. Williams, who has had arduous duties to perform throughout the construction period and since the commencement of smelting about nine months ago.

Mr. Alfred H. Brooks, of Washington, D.C., in charge of Alaskan Mineral Resources for the United States Geological Survey, was in Dawson, Yukon Territory, a short time ago.

Mr. G. J. A. Buisson, for several years on the engineering staff of the Consolidated Mining and Smelting Co. at its Centre Star group of mines, Rossland, B.C., was recently presented by his office colleagues with a gold locket on the occasion of his leaving Rossland for a trip to Salt Lake City, Los Angeles and New York, en route to his old home in Grand Mere, near Three Rivers, Quebec.

Mr. W. B. DeWitt, for several years foreman at the Queen stamp mill, Sheep creek, B.C., has leased the

Ore Hill and Summit gold properties, situated in the mountains a few miles above Sheep creek.

Mr. J. D. Galloway, assistant to the Provincial Mineralogist for British Columbia, has returned to Victoria after having spent the greater part of the field season of this year investigating mining conditions in country through which the Grand Trunk Pacific Railway passes from New Hazelton east to the Rocky mountains. He visited Cariboo district on his way back to the coast.

Two of the officers of the 16th Battalion of the First Canadian Expedition Force, now in England, are Lieut.-Colonel R. G. Edwards Leckie and Major J. E. Leckie, latterly of Vancouver, B.C., but both also well known in Ontario.

"Mr. Herbert S. Hersey, General Manager of the C. O. Bartlett & Snow Co., of Canada, Limited, is reported as improving daily following an optical operation on October 20th.

Mr. Dudley Michel, instructor in First Aid to the Injured for the British Columbia Department of Mines, who since last May has been engaged in his duties among metal miners at a number of mines in West Kootenay and Boundary districts, recently went from Rossland to Kimberley, East Kootenay, to give first aid instruction to miners at the Consolidated Mining and Smelting Co.'s Sullivan group mines in that neighborhood.

Mr. F. S. Pilling, for two years secretary of the Vancouver, B.C., Chamber of Mines, prior to his departure for England, via the Panama canal, about the middle of October, was presented with a gold watch by members of the Chamber as a token of appreciation of his services in that capacity.

### LA ROSE.

The La Rose Consolidated Mines Company on October 1 had a cash surplus of \$1,244,453. A circular to shareholders tells of the present position at the mines. On October 1 ore in transit and at smelters, as well as ore sacked ready for shipment, was valued at \$172,166.

The dividend disbursement totalled \$187,500, which, the circular stated, was being paid from accumulated surplus as it was not earned for the three months just closed. The total earnings for eight months of this year are given as only \$154,000.

Depletion of ore reserves and money spent in looking for new ore bodies are stated to be the causes for the decrease in profits.

Acting on the joint report of Mr. P. A. Robbins, manager of the Hollinger Mines, and General Manager Watson, the directors have decided to inaugurate a plan of exploration. Particulars of the plan are as follows:

1. A new shaft will be sunk on the La Rose Extension, to the west of the railroad, to explore a large tract of conglomerate 300 ft. to 400 ft. thick. This territory is covered by a swamp and has not been prospected on the surface or underground.

2. The high ground on the eastern side of the main La Rose claim will be cleared of soil in hopes of finding surface veins not disclosed by underground prospecting.

3. After the present ore in the Princess claim is exhausted the underground work will be discontinued.

4. In addition to other prospecting on the Lawson, a crosscut will be run to explore the southern portion of the Lawson claim, under the diabase. A limited amount of prospecting will also be done on the University ground from the Lawson workings.

5. The Fisher Eplett property will be closed down.



## SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA

The following information relative to the use of Canadian lead—which means British Columbia lead—was contained in a press despatch sent out from Victoria toward the end of October: “Hon. J. D. Hazen, acting Minister of Militia, has telegraphed Hon. W. J. Bowser, acting Premier of British Columbia, that hereafter Canadian lead will be used in the manufacture of bullets for use by the Canadian troops. The decision follows representations made to the Federal authorities by Mr. R. F. Green, M.P., who represents Kootenay district in the House of Commons, and it is expected to provide for a market for a considerable quantity of the chief metallic product of the lead and silver-lead mines of southern British Columbia. Some days previously Hon. Mr. Bowser had received from the Consolidated Mining and Smelting Company of Canada, Trail, a telegram which read: ‘In respect to the matter of purchasing American lead for the manufacture of bullets, we have had conferences with Mr. R. F. Green. Would it be possible to have specified that such bullets be made of Canadian lead?’ The message was sent on to Hon. Mr. Hazen, who promptly replied that a favorable decision had been reached and the Government had instructed its inspectors to see that hereafter only Canadian lead shall be used for this purpose. Speaking of the matter, Mr. Green said: ‘This decision is very satisfactory and will tend to steady mining conditions in the Kootenay districts. I hope it will be the forerunner of a business development in respect to the products of the lead mines that will ultimately place the lead mining industry on a firm basis.’”

While this development is encouraging, it appears that the way is not yet clear to a resumption of production of lead bearing ores in similar quantity to that reached before the interruption that resulted from the demoralization of the metal markets following the recent commencement of war in Europe. The press despatch above quoted was dated October 28; on October 24 the *Rossland Miner* published the following comment: “The proposals of the Consolidated Mining and Smelting Company, Ltd., for settlement of purchases of silver-lead ores have not met with acceptance of Slocan mine owners, with the result that none of the Slocan mines appear on the list of shippers at present. The change to New York quotations for settlement of lead content of ores is not considered so favorable as the London quotations formerly in use, and objection is taken to the additional 4 per cent. deduction for such lead content. No doubt an effort will be made to arrange these points of contention to enable the silver-lead mines to resume shipment of ores.” It may be added that since the Consolidated Co. obtains by far the larger part of its lead bearing ores from its own mines, it is hardly to be expected that it will go out of its way to benefit owners of other mines, especially under the condition that to all intents and purposes it has a monopoly of lead smelting operations in British Columbia, and can virtually dictate terms to those who find themselves compelled to either send their lead ores to its smelting works or cease production of ores, the chief saleable content of which is lead.”

In connection with this subject of production of lead, it is of interest to note that in his Preliminary Report on the Mineral Production of Canada during

the calendar year 1913, the Chief of the Division of Mineral Resources and Statistics, Mines Branch, Department of Mines, Ottawa, gave information relative to the production of lead, of which the following notes are a part:

“The total smelter production of lead in 1913 was 39,468,729 lb., but this includes lead from American ores and lead contained in scrap, etc., re-smelted, the recovery from Canadian ores having been 37,662,703 lb., valued at \$1,754,705, an average of 4.659 cents a lb., the average wholesale or producer’s price in Montreal for the year. In 1912 the production was 35,753,476 lb., valued at \$1,597,554. The shipments in 1913 were practically all from British Columbia mines, though a small production is reported from Ontario and Yukon Territory. The mines of British Columbia were very active during the year, and the total lead content in ores shipped is estimated at slightly in excess of 54,000,000 lb. Allowing for ‘lag’ and the losses due to smelting the increased difference between ore content and smelter recovery would indicate that a considerable amount of lead ore was in stock at the close of the year.”

**West Kootenay.**

**Ainsworth.**—The only mine in Ainsworth mining division from which ore was received at Trail during four weeks ended October 28 was the J. L. Retalack & Co. property at Whitewater.

From the Kaslo “Kootenaian” it is learned that at the Cork-Provence group, on the south fork of Kaslo creek, the saw mill is being worked, the electric plant is running, and the overhauling of the concentration mill sufficiently advanced to allow of parts of the machinery being given trial runs. Several miners have been sent up from Kaslo. It is expected that both mine and mill will be in operation shortly.

**Slocan.**—The Ivanhoe concentrator, at Sandon, has been leased by J. P. Keane, who has been developing the Wonderful mine for more than a year and has opened some shoots of ore.

Ore shipments from Slocan and Slocan City mining divisions were comparatively small in October. During four weeks ended October 28 receipts at Trail from Slocan mines totalled only 448 tons, of which 14 tons was from the Eastmont, on Ten-mile creek, Slocan City division, and the remainder from mines in Slocan division, as follows: Rambler-Cariboo, 221 tons; Ruth, 83 tons; Silverton Mines, Ltd. (Hewitt-Lorna Doone group), 130 tons. Some high grade silver ore has been packed down to Sandon from the Mountain Con mine, estimated to be worth \$10,000 to \$12,000, but shipment to a smelter is being deferred until metal market conditions shall be less unfavorable than at present.

**Nelson.**—Small shipments of gold concentrate continue to be made to Trail from mines in Nelson division—the Queen on Sheep creek and the Second Relief at Erie having both been on the shipping list in October. The California, a few miles from the city of Nelson, shipped one small lot of gold ore. Three lead mines situated within a radius of ten miles from Salmon, together shipped 289 tons of lead ore during the month; of this 154 tons was from the H. B. mine, 94 tons from the Emerald and 41 tons from the Zineton. Work is being done on several gold properties, in addition to the Queen, in Sheep Creek camp, and as ore of fairly high value is known to occur on two or three of these it is expected that returns will be profitable. Both silver-lead and copper mines in the northern part



of this division, with the exception of the Pingree, are still idle.

**Rosslund.**—Figures showing the quantity of ore shipped from Rosslund mines during four weeks ended October 29 are now available. As compared with the four week period ended October 1, there was a decrease of 449 tons. For purposes of comparison over the last three months the following figures are given here: Quantity received at the smeltery at Trail during five weeks ended September 3, 33,209 tons, or an average of 6,642 tons a week; during four weeks ended October 1, 29,286 tons, or an average of 7,321 tons a week; during four weeks ended October 29, 27,488 tons, or an average of 6,872 tons a week. The total for the three months was 89,983 tons, giving an average of 6,922 tons a week over that period. Nearly all this ore was from the Consolidated Co.'s own mines—53,625 tons from the Centre Star-War Eagle group and 32,636 tons from the Le Roi; the remainder was from the Josie group of the Le Roi No. 2, Ltd. So far as mining news from Rosslund camp is concerned, it is restricted almost altogether to information relating to the ore production of the several mining properties above mentioned. Less important items are that the 22 drill compressor has been removed from the Columbia-Kootenay Co.'s power house to the head works of the Josie mine, and that the Phoenix mine, in the south belt of Rosslund camp, has again been leased.

#### Boundary.

The big copper mines in the neighborhood of Phoenix and Greenwood, respectively, remain closed, as also do the smelting works of both the Granby Consolidated and British Columbia Copper Co. In Franklin camp, up the north fork of Kettle river, work has been resumed at the Union, and a small quantity of ore shipped to Trail, while prospecting and development work on other claims in that camp is being done as well. In Long Lake camp, the Jewel gold mine and 15 stamp mill are being operated without interruption, work in the mine including development on the 500 ft. level. Up the west fork of Kettle river men are working on the Carmi, and the mill on that property has been overhauled.

In Similkameen the gold mining and milling operations of the Hedley Gold Mining Co. continue to be by far the most important in the district. Diamond drilling by the New York Syndicate No. 2 on mineral claims adjacent to the Hedley Co.'s Nickel Plate group, have been stopped for this year, the near approach of cold weather, which affects the long air and water lines, necessitating a suspension of drilling.

The mill at the Dome Lake is now running on a regular basis, though to date it is being used rather as a sampling plant than with an idea of regular practice. The tonnage treated is now about 40 tons a day, but it is expected to raise this to 70 tons without much delay. In the meantime all the ore that is going to the mill has not been picked, and a considerable percentage of waste is being treated. A rock house is now being built, where a bumping table is being installed, and when it is in operation a more even grade of mill rocks can be obtained. Cleanups are being made every twenty-four hours.

Negotiations for the amalgamation of the Porcupine Crown and the North Thompson properties are proceeding. The engineers of both properties have finished their examinations and the principals are now endeavoring to arrange some basis of settlement. Nothing definite has been done yet, however.

In the meantime the Huronian Belt Co. has made the final payment on the North Thompson, and is now in full possession of that property.

Operations at the Vipond are satisfactory to the management. For the most part the ore being put through the mill is coming from the dump now until a refinery has been completed. When it has been built more drills will be put on working underground, and the ore milled will come from below.

### COBALT, GOWGANDA, SOUTH LORRAINE

As the result of the hydraulicking operation of the Nipissing near Peterson Lake two veins have recently been uncovered. They may be said to be extensions of the vein found in a trench in the early days, but as this lead was never followed up they may be classed as additions to the reserve. The veins have patches of high grade ore in place 5 in. wide, and they have been uncovered for about 150 ft. An open cut will be started upon them at once.

During the month of October the Nipissing Mining Co. mined ore of an estimated net value of \$200,384, and shipped bullion from Nipissing and customs ores of an estimated net value of \$324,796.

This company, being by far the largest shipper of bullion from Canada, the camp has been effected by the recent low price of silver. In consequence of the confident belief that the price will soon advance, the bullion for the past two or three weeks has been stored.

The workings from the Fourth of July have now assumed such an extensive character that it has been deemed economical to sink a new shaft at the eastern end of the property 1,200 ft. away. The new shaft will not only be the means of developing the eastern end of vein 98, but it is probable that some exploration work will be done from it as a base. The work will be carried out by sinking from the surface and raising from below.

There is nothing new to report from the work at the 900 ft. level of 64 shaft. Here a drift has been pushed for 330 ft., but the assays are so low as to make the mining of ore unprofitable. However, sinking will continue, and a winze has already been commenced.

The hydraulicking was successful in uncovering five veins altogether during the month, the best of which has already been described. The other four all contain short shoots of good ore.

The high grade mill treated 171 tons and shipped 630,846 oz. The low grade mill treated 7,009 tons.

The production was almost equally divided between low and high grade ore; \$106,363 from high grade and \$94,021 from low grade.

The Timiskaming and Hudson Bay has made what will probably be the final dividend disbursement, at least until such time as the Dome Lake is producing regularly, for some time. The last dividend paid was on Nov. 10th, and was the usual 300 per cent. This company has now paid altogether since its creation 25,000 per cent., or \$1,940,250.

The Right of Way has disbursed a valedictory dividend of one per cent. A month or so ago the company made the final cleanup of their properties at both ends of Cobalt lake.

The Beaver has now cut its station at the 900 ft. level, and shares with the Nipissing the distinction of having the deepest level in camp. The Beaver is intending to sink at once to the 1,000 ft. level, as is also the Nipissing.



The Huronian Belt Company of Canada has taken an option on the Murray Mogridge claims near Wolf Lake. These claims were under option to a Montreal syndicate until recently, and considerable work has been done upon them. The veins are wide but of low grade content.

Considerable difficulty has arisen with regard to the stoppage of Farr creek owing to the large tonnage of tailings that has been pouring into it from half a dozen Cobalt mills for the last three or four years. The township of Coleman has taken the matter up and has had a conference with the Mine Managers' Association and the mines particularly concerned. Farr creek is the outlet of Cross lake, and in the past there has been some lumbering activity, which the stoppage of the creek has interfered with. A basis of settlement is now being sought.

The McKinley Darragh continues to mine very remarkable ore from its new vein to the east. The winze which is being put down continues in fine ore.

### PORCUPINE, SWASTIKA, KIRKLAND LAKE

Porcupine is more than maintaining its position as one of the sections of the country where there is absolutely no industrial depression as evidenced by the fact that there are several hundred more men at work to-day than at the beginning of the war.

At the Dome Mr. Keading is obtaining a new and more thorough revaluation of the property by diamond drilling. A contract for six drills has been let and five of these have been set up on the surface and one underground. These drills will systematically work over the whole known orebody, 1,700 by 400 ft., this area being divided off into hundred feet blocks and vertical holes being sunk. The management desires to discover as closely as possible at this stage the approximate amount of ore they may expect to obtain, so that a larger mill may be planned for and costs per ton run down at once instead of waiting until data have been obtained by the relatively slow process of opening up level after level by means of drift and crosscut. By systematic diamond drilling it is proposed to get an approximate outline of the tonnage and grade, sufficient at least to found a larger scheme of development upon. There is already six years' ore reserves blocked out, these reserves being computed at the present capacity of the mill, which last month treated over 22,000 tons. The various economies introduced in mine and mill are rapidly having their effect. Costs per ton have been cut to \$2.64 and there is every probability that they will be reduced to \$2.50 before the new year is far advanced.

Production is being maintained at just short of a hundred thousand dollars a month.

The October statement of the Hollinger mines shows a slight diminution in gross profits, but the surplus is now \$1,100,755. Both the milling and mining costs per ton were higher than for the previous months, but so was the average value per ton. It is only to be expected that the mining costs will show an increase for some time, since the completion of the new plant will enable the management to put a large number of drills upon development. To date the demands of the mill have made it imperative to keep most of the drills actually on ore and to cut down barren work to the minimum.

Both of the new compressors in the power house on Gillies lake are running very smoothly indeed. The second Nordberg is on the ground and is being rapidly installed. Before the end of the year the whole of

the new plant should be complete and running. To date eighty drills are being run by the new plant, twelve or fourteen of which are on the Acme, which will now be much more vigorously developed.

Good progress is also being made with the forty stamp addition to the mill. By January they should be dropping on ore and the Hollinger should be treating between 1,100 and 1,200 tons of Hollinger and Acme ore. Twenty of the stamps have been reserved for the Acme.

The vein has been cut in the winze at 800 ft. and shows the same grade and width as on other levels. No. 10 vein has been cut on the 220 ft. level, and No. 2 vein extension has been reached by a crosscut upon the 300 ft. level.

In the new shaft excellent progress is being made and the long crosscut which is to make connection with the Miller Middleton is well commenced.

Plans for a 150 ton mill are being prepared by Mr. Joe Houston, manager of the Schumacher Gold Mines. The treatment will be by cyanide and efforts are being made to include the latest improvements as exemplified in the practice of the camp. In the meantime with the small number of drills running excellent footage is being obtained.

### COPPER.

Boston, Nov. 3, 1914.

A serious predicament confronts the copper producers of the United States. As a sequel to the interception off Gibraltar by British war vessels of neutral boats carrying copper and other commodities in their cargoes for neutral ports and the subsequent protest to the state department at Washington by four selling agencies, there has developed the refusal of steamship companies to carry copper to Italy so long as there exists the possibility of detention on the high seas.

Thus there has been put strongly up to the producers of this country the possibility of losing in the near future a large part of the foreign market left for their output following the elimination of Austria and Germany as takers of the metal. England has been taking larger amounts than usual of American copper, but producers do not have the unanimous opinion that England can continue to take large quantities.

When the American producers decided to curtail production 50 per cent. they had in mind the fact that somewhat more than one-half of the country's copper went abroad. Domestic demand has been very quiet for several months, so that in order to "break even" under the restricted output schedule the producers depended upon a reasonable maintenance of the foreign market.

Under the existing extraordinary conditions the exports have been going to Europe at a rate quite comparable with the preceding few months.

England and France have been using large quantities of copper in the manufacture of ammunition. In fact one plant in France has been commandeered by the government to work full time on army orders. Italy has always taken a fair amount of American copper for its own consumption. It also manufactures "bug poison" from bessemerized copper from which comes sulphate of copper. This product is bought by the vine growers of Italy as well as of France.

Crown Reserve has issued notice of the payment of a dividend of 2 per cent. for October. The cheques will be mailed on the 14th and are payable on the 17th of November.

## MARKETS

## STANDARD EXCHANGE.

The minimum scale fixed by the Exchange, and below which no sales are premitted, is as follows:

## Cobalts—

Beaver. . . . .	.17
Buffalo. . . . .	.75
Chambers-Ferland. . . . .	.10
Canadian. . . . .	.05
City of Cobalt . . . . .	.30
Cobalt Lake . . . . .	.30
Coniagas. . . . .	6.00
Crown Reserve . . . . .	1.00
Great Northern . . . . .	.04
Hudson Bay . . . . .	30.00
Kerr Lake. . . . .	4.00
La Rose . . . . .	.70
McKinley-Darragh. . . . .	.40
Nipissing. . . . .	4.75
Peterson Lake . . . . .	.23
Seneca Superior . . . . .	2.00
Timiskaming. . . . .	.07
Trethewey. . . . .	.12
Wettlaufer. . . . .	.04½
York, Ont. . . . .	.07

## Porcupines—

Dome Extension . . . . .	.05
Dome Lake . . . . .	.30
Dome Mines . . . . .	6.50
Foley O'Brien . . . . .	.20
Hollinger. . . . .	16.00
Homestake M. F. . . . .	.20
Jupiter. . . . .	.04
McIntyre. . . . .	.27
Pearl Lake . . . . .	.02
Porcupine Crown . . . . .	.75
Porcupine Peterson . . . . .	.25
Porcupine Vipond . . . . .	.17
Rea Consolidated . . . . .	.10
Teck Hughes . . . . .	.07
West Dome . . . . .	.05

## STANDARD STOCK EXCHANGE.

	Nov. 4, 1914.	
	Ask.	Bid
Cobalts—		
Bailey. . . . .	.01¼	.01
Beaver C. . . . .	20¼	...
Buffalo. . . . .	.80	...
Coniagas. . . . .	6.20	...
Crown Reserve . . . . .	1.01	...
Foster. . . . .	.05	...
Kerr Lake . . . . .	4.50	4.00
La Rose . . . . .	.77	.70
Nipissing. . . . .	5.05	4.90
Peterson Lake . . . . .	.23¼	...
Right of Way . . . . .	.05	...
Timiskaming. . . . .	.10	.08½
Trethewey. . . . .	...	.12
Porcupines—		
Dome Extension . . . . .	.05¼	.05
Dome Lake . . . . .	...	.31
Dome Mines . . . . .	6.51	...

Foley. . . . .	...	.20
Gold Reef . . . . .	...	.01½
Homestake. . . . .	20¼	...
Hollinger. . . . .	18.50	18.40
Jupiter. . . . .	.07½	.07
McIntyre. . . . .	.26	...
Pearl Lake . . . . .	.02¼	...
Porcupine Imperial . . . . .	.01	...

## TORONTO MARKETS.

Nov. 11—(Quotations from Canada Metal Co., Toronto)—

Spelter, 5½ cents per lb.
Lead, 4½ cents per lb.
Tin, 36 cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 12½ cents per lb.
Electrolytic, 12½ cents per lb.
Ingot brass, yellow, 10c per lb., red, 12 cents per lb.

Nov. 11—Coal—(Quotations from Elias Rogers Co., Toronto)—

Anthracite, \$7.75 per ton.
Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Nov. 9—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, \$1.60 per ton.
Foundry coke, prompt, \$2.10 to \$2.50 per ton.

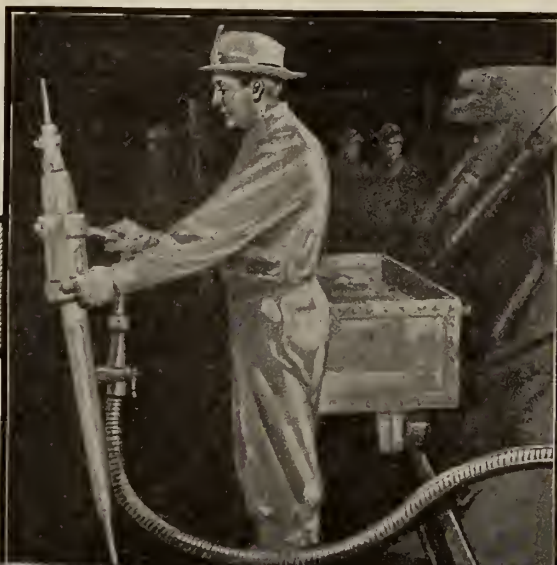
Nov. 9—Tin, straits, 34.25 cents.

Copper, Prime Lake, 11.30 to 11.40 cents.
Electrolytic copper, 11.10 to 11.20 cents.
Copper wire, 12.50 to 12.75 cents.
Lead, 3.50 to 3.55 cents.
Spelter, 4.95 to 5.00 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 17.00 to 18.00 cents.
Aluminum, 18.50 to 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, \$48.00 to \$50.00 per ounce.
Platinum, hard, 10 per cent., \$51.00 to \$52.00 per ounce.
Bismuth, \$2.75 to \$3.00 per pound.
Quicksilver, \$50.00 to \$55.00 per 75 pound flask.

## SILVER PRICES.

	New York.	London.
	cents	pence
October—		
24. . . . .	49¼	22½
26. . . . .	48¾	22½
27. . . . .	48¾	22½
28. . . . .	48½	22¾
29. . . . .	48½	22¾
30. . . . .	48½	22¾
31. . . . .	48½	22¾
November—		
2. . . . .	48¼	22¾
3. . . . .	...	22½
4. . . . .	49¼	22½
5. . . . .	49¾	23
6. . . . .	49¾	23
7. . . . .	49¾	23
9. . . . .	49¾	22¾





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# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS.

<b>Dominion of Canada.</b> <b>Ontario</b> Astley, J. W. Cohen, S. W. Campbell & Deyell. Carter, W. E. H. Evans, J. W. Ferrier, W. F. Forbes, D. L. H. Graham, S. N.	Gwillim, J. C. Handley, John. Hassan, A. A. Haultain, H. E. T. Hille, F. Loring, F. C. McEvoy, Jas. Scott, G. S. Segsworth, Walter E. Smith, Alex H.	Smith, Sydney. Maurice W. Summerhayes. Tyrrell, J. B.  <b>Quebec</b> Burchell, Geo. B. Cohen, S. W. DePencier, H. P. Hardman, J. E. Hersey, Milton L. Johnson, W. S.	Smith, W. H. Ross, J. G. <b>British Columbia</b> Brown & Butters. Fowler, S. S. <b>FOREIGN-New York</b> Canadian Mining & Exploration Co., Ltd. Colvocoresses, Geo. M. Dorr, Jno. V.N. Hassan, A. A.
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## ASSAYERS, CHEMISTS AND ORE TESTERS.

<b>Dominion of Canada</b> <b>Ontario</b> Belleville Assay Office. Campbell & Deyell Heys, Thos. & Son	Canadian Laboratories, Ltd.  <b>Quebec</b> Hersey, Milton Co., Ltd	Dr. J. T. Donald	<b>Foreign-New York</b> Ledoux & Co.
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<b>BURCHELL, GEO. B.</b> Mining Engineer Lignite and Bituminous Coal Mining Examinations and Reports 505 MCGILL BLDG., MONTREAL Cable Address "Minchel" Phone Main 6737	<b>Colvocoresses, George M.,</b> Mining Engineer General Manager Consolidated Arizona Smelting Co., Humboldt, Ariz.	<b>FORBES, D. L. H.</b> Mining & Metallurgical Engineer Chuquicamata, Chile Chief Construction Engineer for Chile Copper Co.
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	<b>EVANS, J. W.</b> Mining Engineer, Mines and Mining Properties exam- ined and reported upon. BELLEVILLE, ONTARIO.	<b>GUESS &amp; HAULTAIN</b> Mining & Metallurgical Engineers 123 Bay Street TORONTO CANADA

# PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

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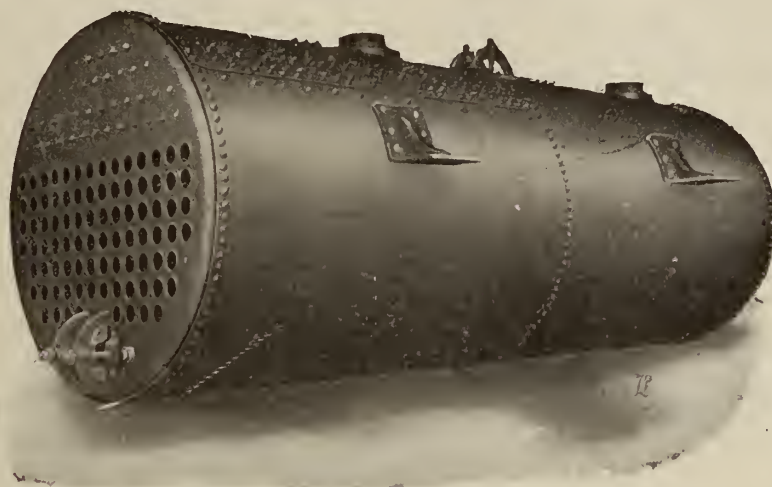
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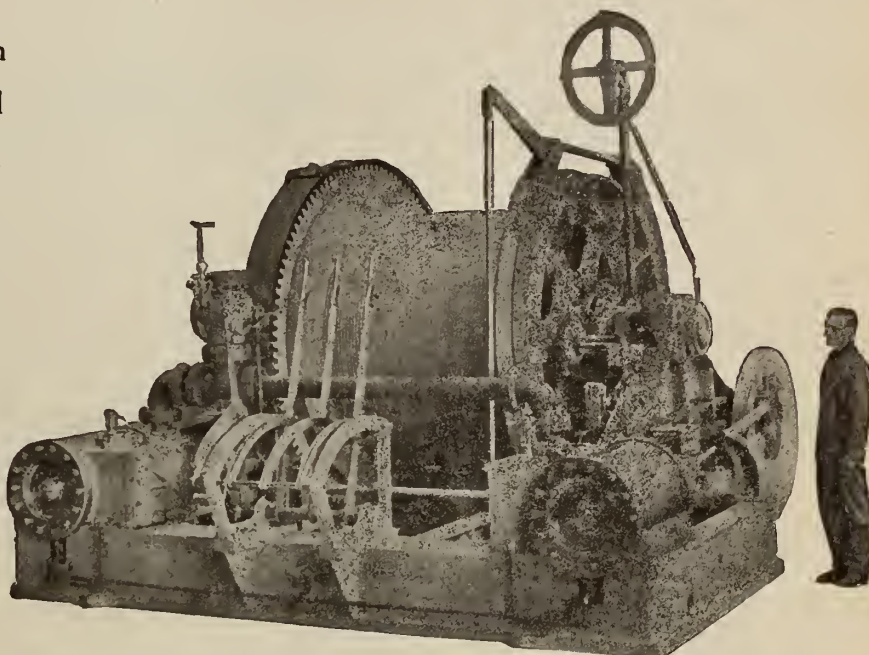
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Peacock Bros.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
The John Inglis Co., Ltd.

**Buckets—**  
Rock & Power Mach'y, Ltd.  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.

**Buildings—Steel Frame—**  
Dominion Bridge Co.  
Canadian Allis-Chalmers, Ltd.

**Cable—Aerial and Underground—**  
Mussens, Ltd.  
G. Taylor Hardware Co., Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Northern Canada Supply Co.

**Cableways—**  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

**Cages—**  
Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers of Canada, Limited  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Jenckes Machine Co., Ltd.

**Cables—Wire—**  
Northern Electric Co., Ltd.  
Standard Underground Cable Co. of Canada, Ltd.

**Carbon (Black Diamonds and Bortz)—**  
Abe. Levine

**Cars—**  
Jeffrey Mfg. Co.  
Mussens, Ltd.  
Northern Canada Supply Co.

**Cement Machinery—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jenckes Machine Co., Ltd.  
Northern Canada Supply Co.  
Peacock Bros.

**Chains—**  
Jeffrey Mfg. Co.  
Peacock Bros.  
Jones & Glassco  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co.  
B. Greening Wire Co., Ltd.  
Northern Canada Supply Co.

**Chain Blocks—**  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

**Chemists—**  
Canadian Laboratories.  
Campbell & Deyell  
Thos. Heys & Son  
Milton Hersey Co.  
Ledoux & Co.

**Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.

**Coal Cutters—**  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.

**Coal Handling Machinery—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

**Coal Mining Explosives—**  
Curtis & Harvey (Can.), Ltd.

**Coal Mining Machinery—**  
Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited  
Peacock Bros.  
Jeffrey Mfg. Co.

**Coal Punchers—**  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.

**Coal Washeries—**  
Jeffrey Mfg. Co.  
Mussens, Ltd.  
Peacock Bros.

**Compressors—Air—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Sullivan Machinery Co.

**Condensers—**  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

**Concentrators and Jigs—**  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers of Canada, Limited  
James Ore Concentrator Co.

**Concrete Mixers—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.

**Condensers—**  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Smart-Turner Machine Co.  
Peacock Bros.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

**Converters—**  
Fraser & Chalmers of Canada, Limited  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Mussens, Ltd.

**Conveying Machinery—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

**Conveyor—Trough—**  
Hendrick Mfg. Co.

**Cranes—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
M. Beatty & Sons, Ltd.

**Cranes—Electric—**  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

**Cranes—Overhead Traveling—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

**Crane Ropes—**  
Mussens, Ltd.  
Allan, Whyte & Co.  
Thos. & Wm. Smith  
B. Greening Wire Co., Ltd.

**Cranes—Swing Jib—**  
The Herbert Morris Crane & Hoist Co., Ltd.

**Cranes—Wall—**  
The Herbert Morris Crane & Hoist Co., Ltd.

**Crushers—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Peacock Bros.  
Lymans, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Hadfield's Steel Foundry Co.

**Cyanide Plants—**  
Jenckes Machine Co., Ltd.  
Fraser & Chalmers of Canada, Limited  
Roessler & Hasslacher  
Thos. & Wm. Smith  
Peacock Bros.

**Derricks—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.

**Diamonds (for Diamond Drills)—**  
Abe. Levine

**Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith & Travers.

**Dredging Machinery—**  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.

**Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers of Canada, Limited  
B. Greening Wire Co., Ltd.

**Drills, Air and Hammer—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.

**Drills—Core—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.

**Drills—Diamond—**  
American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.

**Drill Steel Sharpeners—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Mussens, Ltd.

**Drills—Electric—**  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

**Dump Cars—**  
Sullivan Machinery Co.  
Mussens, Ltd.  
Mussens, Ltd.  
Siemens Co. of Canada, Ltd.

**Conveyors—Belt—**  
Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.

**Dynamite—**  
Curtis & Harvey (Canada), Ltd.

**Canadian Explosives**  
Northern Canada Supply Co.

**Dynamos—**  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.

**Electric Cranes—**  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.

**Elevating and Conveying Machinery—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

**Ejectors—**  
Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

**Elevators—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Peacock Bros.

**Engineering Instruments—**  
C. L. Berger & Sons  
Peacock Bros.

**Engineers and Contractors—**  
Fraser & Chalmers of Canada, Limited  
Roberts & Schaefer Co.

**Engines—Automatic—**  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

**Engines—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Mussens, Ltd.  
Alex. Fleck  
Sullivan Machinery Co.

**Engines—Steam—**  
Smart-Turner Machine Co.  
Peacock Bros.  
John Inglis & Co., Ltd.  
Can. Fairbanks-Morse Co.

**Engine—Haulage—**  
Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers of Canada, Limited  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.

**Engines—Marine—**  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

**Engines—Oil—**  
Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

**Engines—Steam—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
The John Inglis Co., Ltd.

**Fans—Ventilating—**  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.

**Feeders—Ore—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Mussens, Ltd.

**Flights—**  
Hendrick Mfg. Co.

**Friction Hoists—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.

**Forges—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.

**Forging—**  
M. Beatty & Sons  
Smart-Turner Machine Co.  
Peacock Bros.



# Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.  
Main Western Office - VICTORIA, B.C.

This stamp



means quality

Get this stamp on your explosives and you get efficiency.

See us before buying elsewhere.

We specialize in explosives for safe coal getting and rock work.

We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

We also handle the best of blasting accessories, including Electric Fuses, Electric Time Fuses, Safety Fuse, Blasting Batteries, Tamping Bags, Thawing Cans, Connecting Wire and Leading Wire, in fact everything needed for your work.

Our Stumping Powder has made land clearing cheap and easy for the farmer.

We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

## DISTRICT OFFICES:

NOVA SCOTIA:	-	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,	-	-	Kingston
MANITOBA:	-	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,	-	-	-	Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 28.)

**Furnaces—Assay—**  
Lymans, Ltd.  
Mussens, Ltd.

**Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada).  
Limited  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian H. W. Johns-Manville Co., Ltd.

**Gears—**  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.

**Generators—**  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.

**Hangers—Cable—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.

**Hand Hoists—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.  
Fraser & Chalmers of Can-  
ada, Limited

**Heaters—Feed Water—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.

**High Speed Steel Twist Drills—**  
Mussens, Ltd.  
Northern Canada Supply Co.

**Hoists—Air Electric and  
Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Can-  
ada, Limited  
Northern Canada Supply Co.

**Hoists, Chain, Electric and  
Pneumatic—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Hoisting and Conveying Mach-  
inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.

**Hoisting Engines—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Sullivan Machinery Co.  
Fraser & Chalmers of Can-  
ada, Limited  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons

**Hoists—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.

**Hose—**  
Canadian H. W. Johns-Manville Co., Ltd.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.

**Jacks—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.

**Jigs—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.

**Lamps—Acetylene—**  
Mussens, Ltd.  
Northern Canada Supply Co.

**Lamps—Safety—**  
Mussens, Ltd.  
Canadian Explosives  
Peacock Bros.

**Link Belt—**  
Northern Canada Supply Co.  
Jones & Glassco

**Locomotives—Electric—**  
Mussens, Ltd.  
Jeffrey Mfg. Co.

**Locomotives—Steam—**  
Mussens, Ltd.

**Metal Merchants—**  
Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.

**Monel Metal—**  
Orford Copper Co.

**Motors—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.

**Ore Sacks—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.

**Ore Testing Works—**  
Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell

**Ores and Metals—Buyers and  
Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Orford Copper Co.  
Canada Metal Co.

**Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
Northern Canada Supply Co.  
Hendrick Mfg. Co.

**Pick Machines—**  
Sullivan Machinery Co.

**Picks—Steel—**  
Mussens, Ltd.  
Thos. & Wm. Smith  
Peacock Bros.

**Pipes—**  
Consolidated M. & S. Co.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.

**Pipe Fittings—**  
Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.

**Pneumatic Chain Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco

**Producer—Gas—**  
Mussens, Ltd.

**Prospecting Mills and Machin-  
ery—**  
Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited

**Pulleys, Shafts and Hang-  
ings—**  
Fraser & Chalmers of Can-  
ada, Limited  
Northern Canada Supply Co.

**Pumps—Boiler Feed—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.

**Pumps—Centrifugal—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.

**Pumps—Smart-Turner Machine Co.**  
Peacock Bros.  
Thos. & Wm. Smith  
M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
The John Inglis Co., Ltd.

**Pumps—Electric—**  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.

Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
The John Inglis Co., Ltd.

**Pumps—Pneumatic—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.

**Pumps—Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.

**Pumps—Turbine—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
The John Inglis Co., Ltd.

**Pumps—Vacuum—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.

**Quarrying Machinery—**  
Mussens, Ltd.  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.

**Roasting Plants—**  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited

**Rolls—Crushing—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
Can. Allis-Chalmers, Ltd.

**Roofing—**  
Paterson Mfg. Co.  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville

**Rope Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.  
Mussens, Ltd.

**Rope—Manilla and Jute—**  
Jones & Glassco  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.

**Rope—Wire—**  
B. Greening Wire Co.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith  
Fraser & Chalmers of Can-  
ada, Limited  
Mussens, Ltd.

**Rubber—**  
Canadian Consolidated Rub-  
ber Co., Ltd.

**Runways, Hand Operated—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Samplers—**  
Canadian Laboratories  
Ledoux & Co.  
Milton Hersey Co.  
Thos. Heys & Son

**Screens—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
R. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited  
Jenckes Machine Co., Ltd.

**Screens—Cross Patent Flang-  
ed Lip—**  
Hendrick Mfg. Co.

**Separators—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.

**Sheets—Genuine Manganese  
Bronze—**  
Hendrick Mfg. Co.

**Shear Legs—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.

**Shovels—Steam—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
M. Beatty & Sons

**Slime Tables—**  
James Ore Concentrator  
Can. Allis-Chalmers, Ltd.

**Smelting Machinery—**  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited

**Stacks—Smoke Stacks—**  
Canadian H. W. Johns-Manville Co., Ltd.  
Hendrick Mfg. Co.

**Stamp Mills—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited

**Steel Drills—**  
Rock & Power Mach'y, Ltd.  
Sullivan Machinery Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Swedish Steel & Imp. Co., Ltd.

**Steel—Tool—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Can. Fairbanks-Morse Co.  
N. S. Steel & Coal Co.  
Swedish Steel & Imp. Co., Ltd.

**Surveying Instruments—**  
Peacock Bros.  
W. F. Stanley  
C. L. Berger

**Switchboards—**  
Can. Allis-Chalmers, Ltd.  
Northern Electric Co., Ltd.

**Tanks—Cyanide, Etc.—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited  
Jenckes Machine Co., Ltd.  
Hendrick Mfg. Co.

**Tramways—**  
Mussens, Ltd.  
B. Greening Wire Co.  
Can. A's-Chalmers, Ltd.

**Transformers—**  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Peacock Bros.

**Transits—**  
C. L. Berger & Sons  
Peacock Bros.

**Tractors—Oil—**  
Can. Fairbanks-Morse Co.

**Tube Mills—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited

**Turbines—**  
Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited

**Water Wheels—**  
Can. Allis-Chalmers, Ltd.

**Winding Engines—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.

**Wire Cloth—**  
Mussens, Ltd.  
Northern Canada Supply Co.  
B. Greening Wire Co.

**Wire (Bare and Insulated)—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.

**Zino Dust—**  
Roessler & Hasslacher.



# BRITISH COLUMBIA

## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$72,704,603; Lode Gold, \$76,486,512; Silver \$25,832,546; Lead, \$29,696,585; Copper, \$80,818,051; Other Metals (Zinc, Iron, etc.), \$1,852,824; Coal and Coke, \$142,068,615; Building Stone, Brick, Cement, etc., \$20,974,184; making its Mineral Production to the end of 1912 show an

## Aggregate Value of \$460,433,920

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1888, inclusive, \$69,598,850; for five years, 1889-1893, \$15,079,632; for five years, 1894-1898, \$38,738,844; for five years 1889-1903, \$83,807,166; for five years, 1904-1908, \$116,153,067; for five years, 1909-1913, \$137,056,361.

## Production During last ten years, \$253,209,428

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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# The Minerals of Nova Scotia

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The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

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The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

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Commissioner of Public Works and Mines,  
HALIFAX, N. S.

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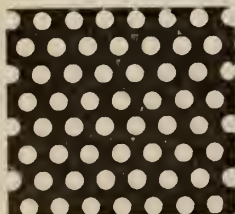
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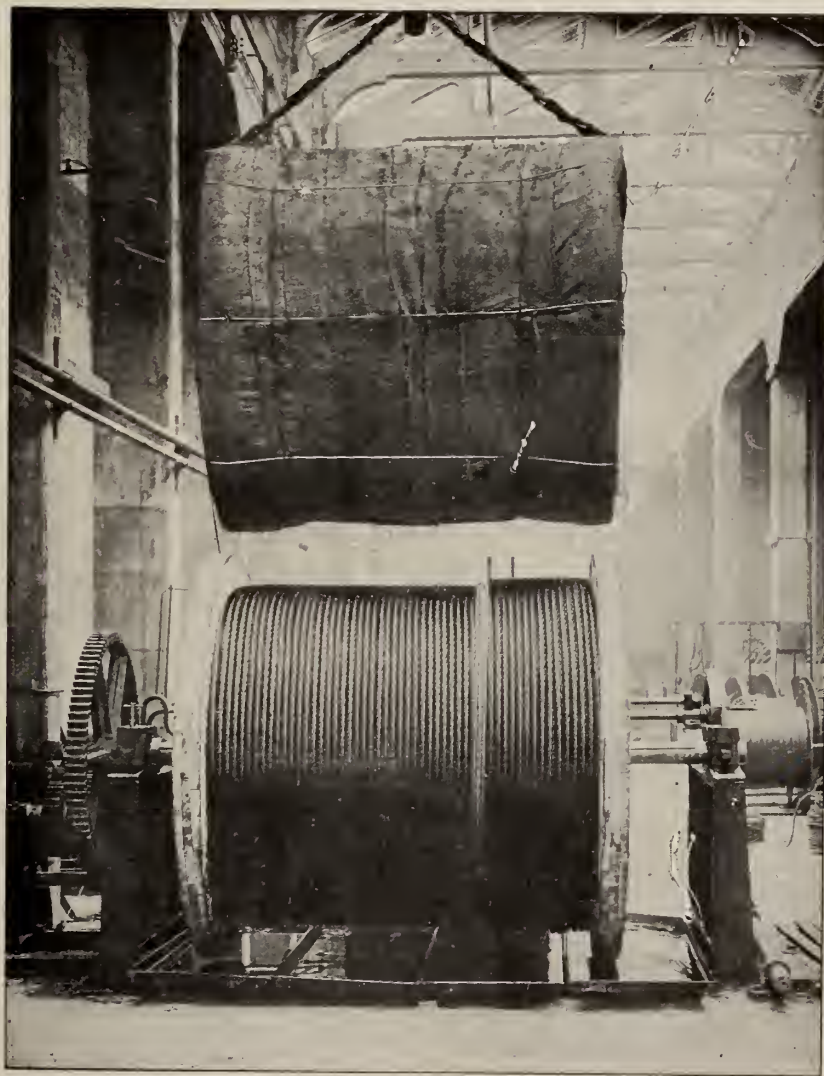
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VOL. XXXV

TORONTO

No. 23

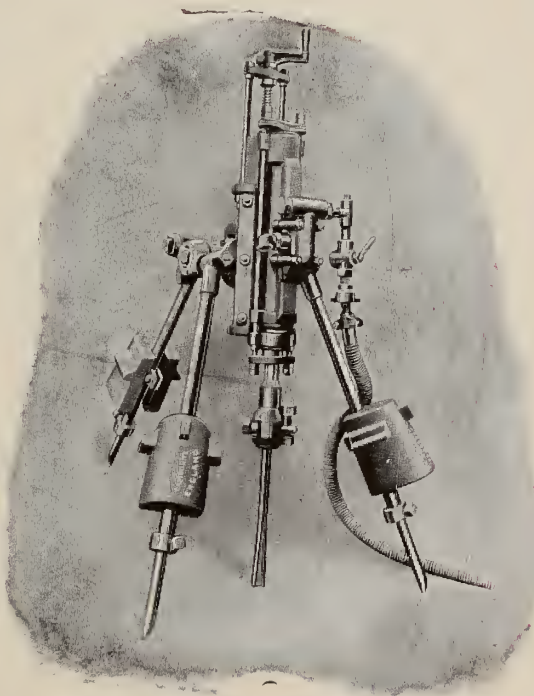
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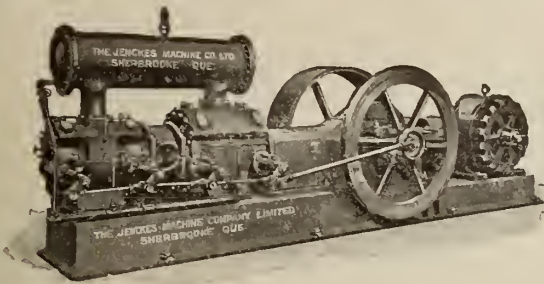
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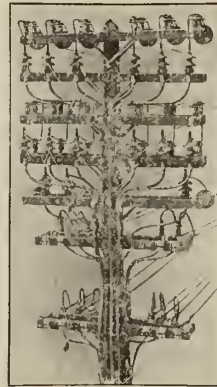
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Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

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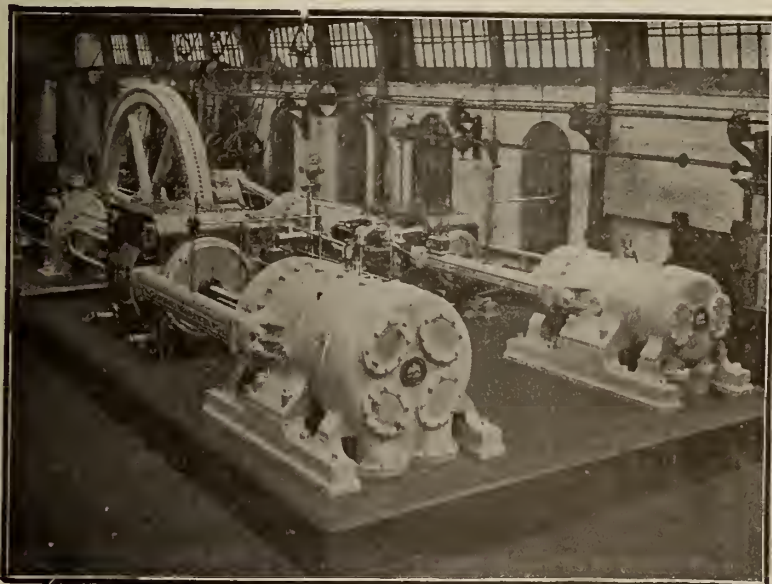
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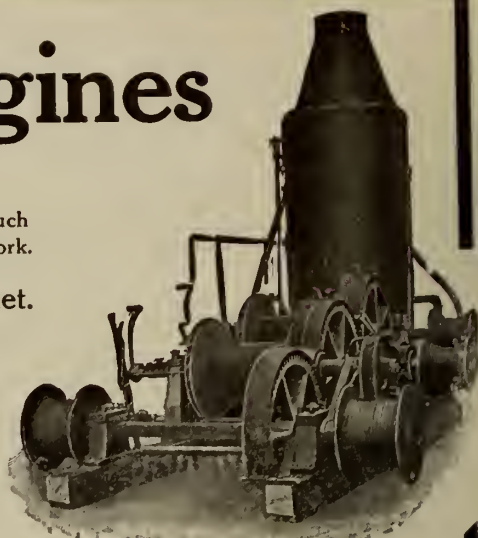
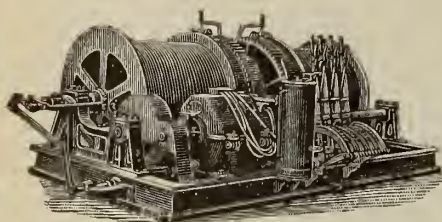
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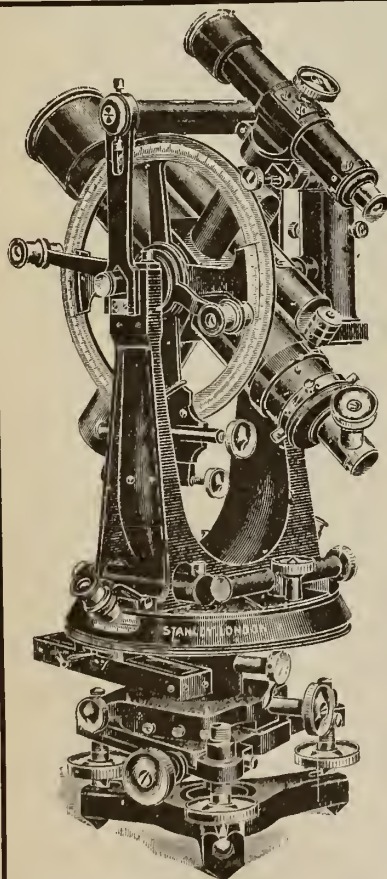


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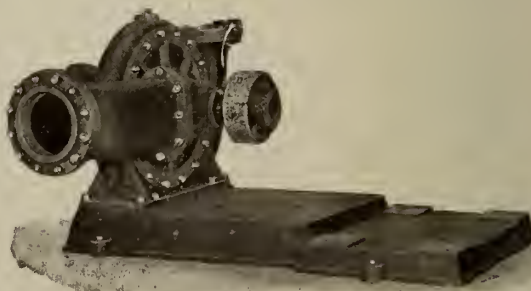
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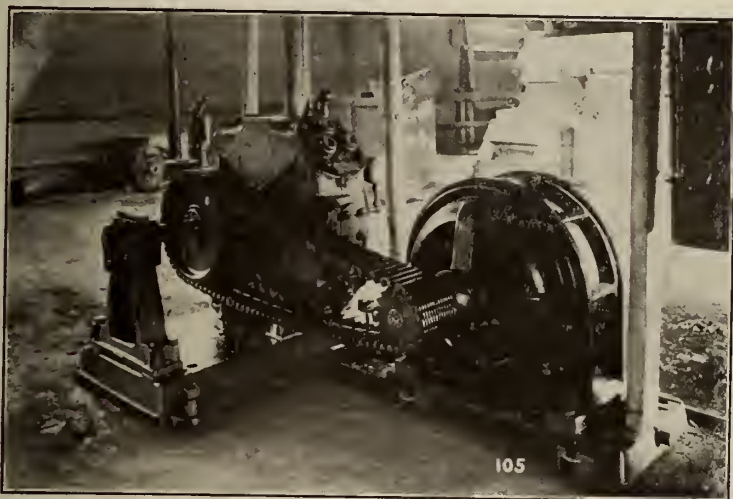
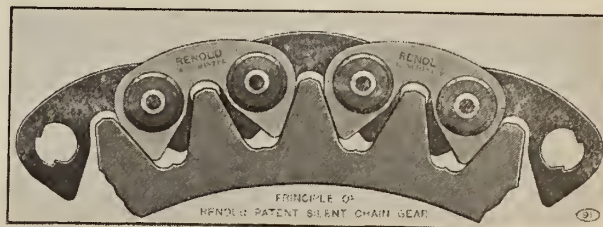
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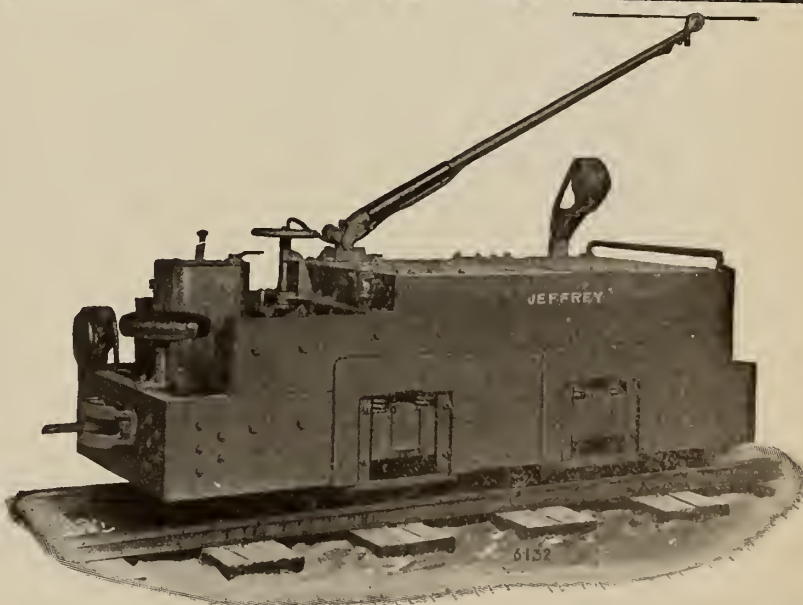
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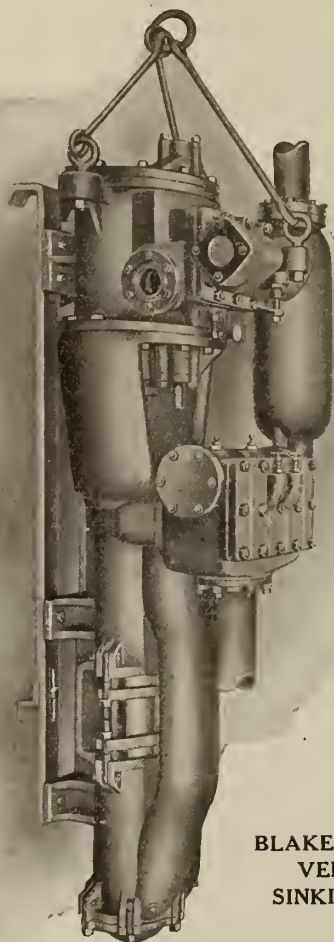
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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, December 1, 1914.

No. 23

## The Canadian Mining Journal

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## EXPORT OF NICKEL MATTE

According to writers in the daily press, nickel won from ores mined in Ontario is being obtained by the enemy. If this is true the traffic should be immediately stopped.

It is well known that nickel is an important constituent of armor plate. An alloy containing about two per cent. nickel, known as nickel-steel, has especially suitable properties for use in war. All nations are aware of this, and a large portion of the nickel output of the world is used in the manufacture of war materials.

Germany, in preparing for war, has been one of the largest buyers of nickel. We may safely assume that Germany has a large stock on hand. And we may just as safely assume that Germany would like to buy more.

The chief seller of nickel is the International Nickel Company of New Jersey. This company controls the Canadian Copper Company, which is the largest producer of nickel ore in the Sudbury district, Ontario, and controls also the Societe Miniere Caledonienne, which owns nickel deposits in the French penal colony of New Caledonia, 900 miles east of Australia.

Obviously Germany will buy nickel if possible from the International Nickel Company. So far as nickel from New Caledonia deposits is concerned, Canada has no right to interfere. But with the sale to the enemy of nickel obtained from Sudbury ores it is not only Canada's right, but her duty to interfere. Steps should be taken, and are being taken, to determine whether Canadian nickel is reaching the enemy. If such is the case the Canadian Government will have to devise a scheme for prohibiting such business. There is as yet no proof of the statements made in the daily press; but until the statements are disproved Canadians will be uneasy.

The Toronto Star advocates the prohibition of export of nickel ore outside the British Empire. As Canada does not at present export nickel ore the Star's effort suffers somewhat from lack of accuracy in statements. Matte, not ore is probably intended in the following paragraphs from the Star:

"It is a pity there ever was such a trade with Germany, and it ought now to be cut off for good and all, during the war and afterwards. Germany ought not to get an ounce of Canadian nickel. The bulk of the nickel exported is for the protection of warships and the covering of shells, and Canada must not in the smallest degree furnish the materials of war for Germany, directly or indirectly.

"The surest way to bring about the desired result is to forbid the export of the ore to any place outside the British Empire. If the nickel were refined in Canada it

would be comparatively easy to control the export, allowing the nickel to go only to Great Britain, France or Russia. As long as we export the unrefined ore the export should be confined to Great Britain or to places designated by the British authorities.

"The effect of this prohibition upon the industry of getting out the ore is of comparatively small importance. The supreme object is to prevent a necessary munition of war from getting into the hands of the enemy. We might just as well send soldiers to enlist in the German army as nickel to be used for the navy. Canada controls all the nickel in the world except the mines owned by France, and Canada should help France to starve Germany out of this material."

Even when we read "matte" for "ore" in the Star's editorial, the policy seems a ridiculous one. The bulk if not all, of the nickel exported from the United States is going to the Allies and not to the enemy. The Star in an effort to interfere with possible sales to Germany wants to adopt a measure which would certainly be more embarrassing to the Allies than to the enemy.

The Montreal Journal of Commerce had the following editorial in the Nov. 18 issue:

"The nickel question has been brought to public notice from time to time for quite a long period. In the past it has usually been a debatable question. Now it has assumed a form which hardly seems to admit of debate. An export duty on nickel produced in Canada has sometimes been advocated as a measure for obtaining revenue. But export duties for revenue purposes, involving, as they necessarily would, much interference with trade, have not commended themselves to Finance Ministers.

"Export duties on nickel 'matte' have often been advocated as a means of compelling the producers to refine the nickel in Canada. Such a policy would naturally commend itself to high protectionists who argue that all manufacturing shall be done at home. Three years ago much was heard of that kind of policy, the country ringing with the cry, 'Let us keep our raw materials at home,' but to-day one hears it not, and the foreigner remains as free as he was then to take our raw materials away to be manufactured abroad. As a purely commercial and industrial question the propriety of preventing the export of raw or semi-raw materials has always been, to say the least, open to debate. There was room for difference of opinion as to the wisdom of prohibiting the export of nickel in its 'matte' shape. Canada, while a large producer of nickel, had not a monopoly of it. The French island of New Caledonia had nickel. Interference with the export from Canada might close the Canadian industry and give the producers in New Caledonia the control of the business. A large sum of money had been invested in the Canadian nickel mines at Sudbury. It was nominally American capital. But foreign capital invested in good faith in Canada was entitled to the protection of Canadian laws. If prohibitive export duties would, as was alleged, close the operations at Sudbury, and transfer the nickel busi-

ness to another country, such regulations would be unjust to the men who had invested their capital, and to all concerned in the Canadian industry. Whether such would be the result was a debatable question. Those who opposed the suggested restrictions seemed to have some ground for their contention.

"Thus proposals for export duties in the case of nickel, either for revenue purposes or for the development of home manufacturing, came within the field of debatable questions. If proposals that are now being made in the press rested on the same grounds as the earlier ones, they would still be debatable. But they do not. The present proposals respecting nickel rest on an entirely new ground to which the objections of the past do not apply. The strictly economic question must stand aside. The question now is one created by the war.

"Canada's nickel has been going to the United States to be refined and then sold, to a very large extent, to Germany. There are those who will say that such a policy should never have been allowed. It is too late, however, to discuss that policy as respects the past. It is not too late to discuss it and deal with it as respects the present and the future. When the question was a purely economic one, the argument could be used that Canada could not control the nickel industry. Canada alone to-day could not control the industry. But Canada's rival, New Caledonia, is French territory. Canada, as a part of the British Empire, is an ally of France in the war. The Allies, then, can control the nickel industry and prevent Germany receiving this product so necessary to her war measures.

"Since the question was brought prominently to public attention a few weeks ago, a step has been taken at Ottawa which may lead some people to imagine that no further harm can be done. An Order-in-Council has been passed prohibiting the export of nickel from Canada to Germany or the enemy countries. But this order does not meet the case. No nickel has been sent from Canada to Germany. There are no nickel refineries in Germany. The Krupps have their interest in the refinery in New Jersey. The nickel in the 'matte' shape goes from Canada to New Jersey, where the refining takes place, and from the American refinery to Germany, and to any other country wanting it. That has been the course of the business in the past; that is the course now, and the new Order-in-Council, forbidding the export of nickel from Canada to Germany, does not touch the case at all. So far as the public can see, Germany is to-day as free as she ever was to take Canadian nickel and use it in her warfare against the British Empire. We send our soldiers to fight for the Empire, and we send our nickel to help the Germans make war upon us.

"In the past, the convenience of trade, the interests of the workers at Sudbury, the protection of capital invested in Canada, afforded some reason—or at least some excuse—for a policy of non-interference with the nickel business. But these considerations can no longer weigh



in the scale. Nobody would desire interference with business under ordinary conditions. But we no longer have ordinary conditions. The conditions raised by the war are supreme. They demand that Canada shall no longer supply Germany with war material. If adequate guarantees could be had that the material would not find its way to Germany by way of the United States, such might meet the case. But it is not easy to see how such guarantees can be obtained. The engagement of Messrs. Krupp & Co.—the American company—that they will not send any more nickel to the Krupp factories in Germany could hardly be regarded as sufficient. The guarantee of the United States Government, under satisfactory conditions, might meet the difficulty. But it is doubtful if the United States Government would be willing to undertake such a responsibility. Unless some such guarantee can be obtained, the only way seems to be to prohibit the export of nickel in any form to any country outside the British Empire.”

While apparently better informed than the *Star*, the *Journal of Commerce* seems also to be of the opinion that extreme measures should be taken to prevent any possibility of nickel reaching Germany. It is very doubtful if the Allies would greet such a proposal very enthusiastically. Is it such an easy matter to deliver cargoes of nickel to Germany? Have the Allies no need of nickel from New Jersey?

Canada exports nickel matte. We have no nickel refinery here, and it would take months to establish one. The prohibition of the export of nickel matte means therefore the cutting off of the chief source of a metal for which there is a great demand. And this is being advocated by our contemporaries without proof that any of the nickel from Canada is being obtained by Germany.

## NICKEL DEPOSITS OF NEW CALEDONIA

The only serious competitor of the Sudbury nickel district is New Caledonia. Nickel was discovered there in 1865 by Mr. Jules Gardner. Mining began in 1875. In 1889 the output was 21,000 tons of ore. In 1902 there was produced 128,653 tons ore, containing about 7,000 tons nickel. For some time the output has, according to Dr. A. P. Coleman, been between 80,000 and 120,000 tons.

Most of the nickel ore mined in New Caledonia has been exported and treated in France, Germany and Scotland in small smelters and refineries operated by the *Societe le Nickel*. Dr. Coleman reports in his monograph on the Nickel Industry that early attempts at smelting on the island were unsuccessful; but that in 1910 a furnace was operated and 769 tons of matte exported.

According to M. E. Glaser, who reported on the mines for the French Government in 1903, the nickel occurs in veins of hydrated silicates in serpentinized masses of peridotite. The richest silicates are soft green

minerals known as garnierite and noumeaite. The veins are small and many of the deposits have been long since worked out. A large number of small veins are being worked in various parts of the island.

That the deposits are capable of yielding a much larger output than at present is indicated by reports that certain parties have advocated placing a heavy tax on unworked nickel lands on the island, so as to force the owners to work more actively the properties leased from the Government.

Owing to the nature of the deposits and to their location, the New Caledonia ores do not yield as large a profit as the Sudbury ores, although they are richer. If, however, the cost of producing nickel from Sudbury ores is unduly increased by any means, the New Caledonia mines may be expected to be more actively operated.

The recovery in the price of copper from eleven cents to over twelve and one-half cents per pound, which has been recorded in the past two weeks, is of the utmost importance to copper producers. A large amount of copper is produced at a cost of eleven or twelve cents per pound, and the recent rise means success for some companies which could not long operate under the low price of two weeks ago. Even at the new high price several large producers are making little or no profit, owing to the fact that costs have risen on account of the output being curtailed. These companies will, however, welcome the rise, for they have been operating at a loss and now have a chance of breaking even while awaiting a better market.

It is understood that much of the copper recently sold has been for consumption in the United States. This indicates a resumption of business there that has been confidently looked for, but which has been slow in making its appearance.

It is stated also that in spite of the elimination of Germany from the market, European orders are coming in freely. This is undoubtedly due, largely, to the large consumption of copper in the ammunition works in Great Britain, France and Russia. There is as yet, however, no great hope of very high prices for copper.

The price of silver has been disappointingly low during the past month. It is therefore a pleasure to record that the tendency during the past few days has been upwards.

There has been much speculation as to the orders brought back by Mr. Charles M. Schwab after his recent trip to England. Orders of great importance were doubtless booked. One paper says that it has good authority for the statement that Mr. Schwab obtained contracts for \$50,000,000 to be filled by the Bethlehem Steel Company and affiliated companies. Whatever the exact figure may be there is reason to believe that Mr. Schwab has been largely instrumental in obtaining business for United States manufacturers at a time when it is badly needed.



## CORRESPONDENCE

### CENTRIFUGAL COMPRESSORS

To the Editor of The Canadian Mining Journal:—

Sir,—In the issue of Oct. 15th, there appears an article under the head of "Centrifugal Compressors." In the latter part of this article, a comparison is made between centrifugal and reciprocating compressors; but the case of the latter has not been fully presented. In the case of low pressure compressors, or the low pressure cylinder of a multi-stage compressor, where the pressure is about 25 lbs. per sq. in. gauge, and assuming that the machine is of correct design and workmanship for the work it has to do, the clearance will be between 2 and 5 per cent., giving a volumetric efficiency, due to clearance, of from 95 to 98 per cent.

At the end of the stroke the clearance space is filled with air at the compression pressure. This pressure must decrease to atmospheric pressure before any fresh air can be drawn into the cylinder. The expanding air, by its pressure on the piston, returns the power that was used in compressing it; but by preventing the entrance of air from the outside during the interval of expansion it causes a decrease of capacity.

The statement that some designers have attempted to increase the volumetric efficiency, by increasing the velocity of the air at intake, is correct, and it is the regular practice among some of the German manufacturers of gas engines and blowing engines. The air cylinders have Corliss valves, and the air is taken in through a duct or pipe of some length. The air in this pipe undergoes changes in velocity influenced by the variable velocity of the air piston at various points of the stroke. The piston starts with zero velocity, attains maximum velocity at midstroke, and again has zero velocity at the end of the stroke. In the beginning of the suction stroke, there is a tendency to accelerate the column of air moving in the suction pipe, which tends to produce a drop of the pressure below that of the atmosphere during the early portion of the stroke. At some point near midstroke of the compressor the velocity in the suction pipe has attained its maximum, after which a retardation takes place. When the piston has reached the end of the suction stroke, and has stopped, the column of air is still moving, the result being that the pressure of the air in the cylinder rises above that of the atmosphere. If the suction valve can be closed at the moment when this attains its maximum pressure the cylinder will be filled with air at a higher pressure than that of the atmosphere, and thus be enabled to deliver more air than that due to the difference of the piston displacement and the expanded air in the clearance spaces. In other words the volumetric efficiency will be 100 per cent. or higher.

This extra air is not obtained without a corresponding use of power and the cost per cubic foot of air, compressed and delivered from free air at atmospheric pressure and temperature, will be practically the same, whether the compressor has a volumetric efficiency of 95 or of 100 per cent.

A compressor that is designed and built for the economical operation in the particular work it has to do, will hold up its original efficiency during its lifetime with no greater—often less—cost for upkeep than the engine to which it is attached.

There can, however, be no comparison between the above and what may be called the commercial type of compressor, which must be designed and manufactured

cheaply, in order to sell at the low price at which they are offered. Each type of compressor has its own field. A guarantee of the capacity in cubic feet of free air at atmospheric pressure and temperature of any compressor at a given speed, should also include the steam consumption for every 100 cu. ft. of free air, that is compressed and delivered, under the specified conditions.

This gives a definite basis for a comparison of the claims made by the different builders of compressors, in terms of actual cost of operation, which is much more satisfactory to the intending purchaser than a lot of indefinite and bewildering statements regarding "efficiency." A comparison of the horsepower required for the adiabatic compression of a certain quantity of air with the indicated horse power of the steam end of the compressor when compressing the stated quantity of air will show the total, or over all "efficiency" of the compression. In a compressor driven by an electric motor the power imparted to the motor can be compared to the power required for adiabatic compression of the given amount of air, to show the over-all "efficiency."

Yours, etc.,

Hamilton, Ont., Nov. 26, 1914. A. WILLCOCKS.

### ORIGIN OF THE ROCKY MOUNTAINS.

On the evening of November 3, at Nelson, British Columbia, Mr. Stuart J. Schofield, of the Geological Survey of Canada, gave an address before the local University Club and others interested, on the subject of the Origin of the Rocky mountains. The Nelson "Daily News" published a brief synopsis of the address, as follows:

"Mr. Schofield began by placing on the blackboard an outline of the geological timetable from the pre-Cambrian down to recent times and referred the several divisions of the great Cordillera to this as he proceeded with his address.

"The pre-Cambrian nucleus of the mountain system of the Province was, he said, a rolling body of land near the Columbia valley. Bordering this to the east was a shallow sea stretching far across the region now occupied by Eastern British Columbia and the plains. In this sea the sediments from the ancient land were laid down. Long afterwards in Jurassic times the sediments of this sea were elevated in great folds to form the Selkirk and Purcell mountains. The shore line of the great shallow sea then lay near the great trench now occupied by the Kootenay and Columbia rivers. Still again erosion of these great ranges provided further sediments, which in Cretaceous times were crushed and folded upward to produce the Rocky mountains.

"The unfolding of a mountain chain gives rise to streams that destroy it. The ancient rivers met the shore at right angles, while the folds rose slowly across them; so slowly that in many cases the streams were able to maintain their channels. Such is the nature of the Crowsnest pass. New stream valleys lie between the upfolds, as in the case of the great trench of East Kootenay.

"The finishing touches to the mountain scenery have, he said, been given by ice. Glaciers have produced at the head of the streams countless little basins or cirques occupied by small tarns and bordered by sharp ridges. These are among the features of greatest beauty and charm, the richest reward of the tourist and mountaineer."



## FIGHTING FIRE AT THE ALBION MINES, NOVA SCOTIA

Last July a serious fire occurred in the McGregor seam, Albion mines of the Acadia Coal Co., Nova Scotia. The fire gained steadily in spite of attempts to put it out with water; but was finally brought under control by the construction of barriers. In this work oxygen helmets proved indispensable. The courage of the men and the resourcefulness of the management saved the mine from destruction.

The McGregor seam is the lowest of four being worked at the Albion mines. The others in order from surface are the "Ford Pit," "Cage Pit" and "Third." These seams are all quite thick (from 12 to 40 ft). Overlying the Cage Pit Seam is a small seam known as the "Four Foot Seam" and overlying the McGregor Seam is a seam about 3 ft. 6 in. thick called the "Flemming Seam."

In order to seal off the west side, the oxygen helmet men were sent down in a small shaft 187 ft. deep which is connected directly to the fans. From the bottom of this shaft the main return airway branches east and west. The oxygen helmet men built a stopping in the west side and the fan was started slowly on July 20th at 6 p.m. During the night the east side of the mine was slowly cleared of gas by a crew of oxygen helmet men who proceeded down the slope, opening and closing the doors on the east side and plastering the stoppings on the west side until they had penetrated practically into the pump room at the bottom of the slope.

The stopping at the foot of the fan shaft could not have been built at all without the oxygen helmets and consequently the reopening of this mine could not



No. 1



No. 2

### FIRE FIGHTERS AT MCGREGOR MINE, NOVA SCOTIA

The workings in the McGregor Mine immediately underlie the workings in the other seams and are not connected in any way except by boreholes. Hoisting is done by an electric winding engine through the slope and ventilation accomplished by an electric fan, with the old steam fan as a stand by.

Fire was first noticed July 9th in the early evening. After considerable difficulty a place was won from which it could be attacked by water and this attack was kept up from midnight Friday until Sunday morning. The fire gained steadily however, and on Sunday July 12th it was found necessary to withdraw the men and seal up the mine. This was done by building stoppings in the mouth of the slope and by sealing the fans.

The fire was confined entirely to the West side of the mine and after leaving it sealed for one week, it was determined to attempt to close all the west side more tightly and restore partial ventilation in the east side so as to give access to the electric pumps which handled the draining of all four seams.

have been done until the fire had absolutely killed itself.

After the east side of the mine was cleared of gas, the oxygen helmet men constructed a line of stoppings on the west side of the slope above the fire section which completed the sealing off of this section. To-day the east side of the mine is working but the fire section has not been reopened.

This is a mine which has always given trouble from fire. Several years ago it was necessary to seal off and flood a portion of the east side of the mine. This portion was subsequently reopened and is now being worked.

During the time when the fire was being fought with water oxygen helmets were used by the advanced hose men. These men have had considerable experience at this kind of work. In the summer of 1913 there was a very bad fire in the Cage Pit Seam at the same mine. It was an open fire and was attacked with water. Before it was put out, five 2½ in. streams were playing



on it. It was absolutely impossible to approach the fire region except under oxygen. For 16 days and 17 nights the men of this mine fought this fire steadily 24 hours a day, working in 6 hour shifts. The heat was so intense that the oxygen men could only work 15 to 20 minutes at a time. This fire occurred quite close to the return airway at a point where it was absolutely impossible to build stoppings and absolutely fatal to retreat. The distance of only 150 ft. lay between the original seat of the fire and the main return airway from which it was attacked but to cover these 150 ft. required 16 days of what was probably the hardest fire fighting that Nova Scotia has ever seen.

Photograph No. 1 shows the oxygen helmet men dressing just outside the fan house and shows also the discharge from the centrifugal pumps which are located in the McGregor Slope some 5,000 ft. from the surface at a depth of about 1,800 ft. vertical. The new electric fan is in the background.

Photograph No. 2 is a nearer view of one of the oxygen helmet men getting ready to go down.

### GERMAN REPORTS.

A Geneva newspaper, *La Suisse*, makes itself responsible for the following alleged despatch from the German official press bureau:

"Gen. Von Kluck's army captured Paris without noticing it and arrived at Vincennes on Sept. 8, while it still believed it was at Fontainebleau. It marched through the deserted town, all the population having taken refuge in the sewers and subway tunnels, which partly explains Von Kluck's error. On Sept. 10 he occupied the Tuileries. 'Anyway, wherever are we?' the general asked.

"A small Paris gamin, like all the French ever ready to guy any one, replied, 'At Barbizon.'

"At Saint Cloud, on Sept. 12, Gen. Von Kluck received a message from his comrade, Von Buelow, saying in substance that he had moved so rapidly that contact between the two armies might be broken at any minute. Von Kluck decided therefore to move back, not without carrying off much booty, notably the Dome of the Invalides, the Eiffel Tower, the Strasbourg statue from the Place de la Concorde, the wings of the Moulin Rouge, the tail of the Rat-Mort, the floor of the Bal Tabarin, the Vendome column and the soles of Marguery.

"He succeeded in forming a junction with the army of Von Buelow on the evening of Sept. 13, accompanied by 400,000 or 500,000 prisoners.

"A new difficulty then arose. The new 420 millimeter mortars were so powerful that their projectiles passed over Paris and dug holes in the Atlantic ocean. A shell even fell within a few miles of New York. President Wilson having protested against what he fallaciously deemed a violation of national rights, the order was given for the whole German army to perform a strategic retreat until their mortars would be at a suitable distance from the French capital.

"He commenced his withdrawal after taking prisoners all the bootless enemies who ventured imprudently on the plains of the Marne. It is generally believed that the 420 pieces can at last be used from Berlin to annihilate what remains of the pitiable defences of France.

"Lovers of truth are requested to make the foregoing known all around them for the sake of humanity and civilization."

### THE POTASH SITUATION IN U. S.

Conditions governing the potash situation have improved noticeably during the past two weeks. Muriate and sulphate of potash prices from second hands declined \$6 to \$8 per ton in the New York market. These salts have been in urgent request from chemical and pharmaceutical manufacturers since the war began and many sales were made in excess of \$100 per ton.

The drop in values was due partially to the fact that potash salts in some form or other are arriving at various ports in a fair way. In addition arrangements have been made for future shipments and it is believed that the trade can depend on a certain amount of potash at regular intervals hereafter. The arrangement, of course, is to pay for the potash before it leaves Germany in American gold and make the ownership of it so certain that it will not be subject to seizure by war vessels of the belligerent nations.

While it cannot be truthfully stated that the entire trade has taken up this method of securing potash, yet sufficiently large quantities have been transferred to American ownership to make shipments total rather surprising figures, considering the difficulties encountered. Thus during September, 11,836 tons of kainit 6,737 tons of manure salts, 2,863 tons of muriate of potash and 1,080 tons of sulphate of potash arrived at all American ports.

During the past fortnight one lot of 1,100 tons of manure salts came in at New York, which is not ordinarily a large importer of fertilizer chemical salts, most of this material going to the more southern ports. October shipments from Germany are reported to have reached a fair total, which, however, considering the amount actually needed here, is but a drop in the proverbial bucket. Naturally there is considerable secrecy prevailing in regard to arrangements made to ship from the other side, but no one now attempts to conceal the fact that considerable tonnage has been negotiated for and will undoubtedly be delivered to American consumers in due course.

September imports of all potash salts exceeded 22,000 tons and it is reasonable to presume that as time progresses shipments will become more of a matter of fact, unless the nations at war should suspend traffic in this material. No embargos have been on potash exports from Germany for some time past and the American State Department has expressed the opinion that American-owned goods in neutral bottoms are not subject to seizure.

A very interesting arrival during the past week at the port of New York was a lot of 453 short tons of material invoiced as "salinum potassium" from Genoa. This is the Italian "salino potassico." This is a mixture of alkaline salts extracted by the Italian distilleries by distillation from residue of fermented beet molasses. The residue, when concentrated, is calcined and contains approximately 47.20 per cent.  $K_2O$ . It is sold on the basis of the potassium carbonate content and is, of course, a valuable tobacco fertilizer. The product seems to be quite similar to the German "schlempekohle"—a potash carbonate extracted from beet sugar residue—the total production of which is stated to be 25,000 to 30,000 metric tons annually. No doubt, with sufficient incentive, the beet sugar factories here could produce a considerable tonnage of this product annually.—American Fertilizer.



## COAL MINING IN ALBERTA IN 1913

By John T. Stirling (Chief Inspector of Mines, Alta.).

The total amount of coal produced in Alberta during the year was 4,306,346 short tons, which is an increase of 859,997 tons over the amount produced during the year 1912.

The amount of coal produced per person employed during the year 1913 shows a still further increase over previous years. This is due to a great extent to the increased use of coal-cutting machinery in the lignite field. The number of tons of coal produced per pound of explosive used has increased considerably in the Crow's Nest Pass district, although I regret to note that the number of tons of coal produced per pound of explosive used shows a decrease in the other districts.

The output of coal from the Province for the year 1913 has increased approximately 500 per cent. during the last eight years. The output, however, during the year 1913 would have been considerably larger had it not been for the extremely mild weather which we had during the latter part of the year and in consequence of which, the consumption of domestic coal was considerably reduced. The steam coal market was also reduced as the railway companies have laid off during the year a large number of train crews.

The Coal Mines Act, which had been in force in the Province for several years and which had been amended from time to time at recent sessions of the Legislature, had become rather unwieldy. The Government, therefore, appointed a commission to go thoroughly into the whole question of mining regulations, with the result that a complete new Act was prepared and assented to by the Lieutenant-Governor in Council on March 25th, 1913, and came into force on August 1st of the same year. The Act, which is known as The Mines Act, appears to be working very satisfactorily. On September 17th, 1913, "Rules for the Installation and Use of Electricity in or About Mines" were passed by Order-in-Council and are now in force. These rules are for the purpose of regulating the use of electricity in or about mines, and should do a great deal towards the prevention of accidents from this cause. Among other things, they provide that a qualified electrician shall be appointed at all mines where electricity is used. This electrician is responsible for seeing that the plant, etc., is kept in good repair.

In a number of the mines in the Lethbridge district, where safety lamps are not required, Pellet powder is being used, and I trust that before the end of the present year, most of the mines in this district will be using powder of this nature.

Owing to the presence of gas in the lignite mines, it has been found necessary to install safety lamps in a number of cases. In all cases, the safety lamps installed are of the Wolf type, with the exception of the No. 6 mine, operated by the Department of Natural Resources of the Canadian Pacific Railway Co., near Lethbridge, where electric lamps have been installed.

There is a growing tendency to use gasoline locomotives for haulage purposes, particularly in the Crow's Nest Pass mines, and in order that those locomotives can be operated under as safe conditions as possible, it is my intention to have prepared, some time during the year, rules governing their use. These rules will be put into force at the earliest opportunity.

A large number of accidents have taken place in the smaller mines. Of the 28 fatal accidents which occurred in the Province, six occurred in mines which produced less than 50,000 tons during the year; seven in mines which produced from 50,000 to 100,000 tons; eight in mines which produced from 100,000 to 200,000 tons, and seven in mines which produced over 200,000 tons. This is no doubt due to the fact that the smaller mines are under the charge of men who do not hold First Class certificates, and who are not so conversant with The Mines Act as the persons who are in charge of the larger mines. The inspectors again report that they find considerable difficulty in getting the provisions of The Mines Act complied with at the smaller mines.

A large percentage of accidents, particularly in mines in the Lethbridge field, where mechanical haulage is used, are caused by persons riding on cars. As in most cases this is a contravention of The Mines Act, steps are being taken to have this practice stopped.

Considerable progress has been made during the past year with the installation of telephones in the larger mines. These telephones save a considerable expense in the operation of a mine and are also very useful in obtaining assistance quickly in case of an accident.

There were 72 mines abandoned during the year 1913. A large number of these mines, however, were only opened up for the purpose of prospecting for coal and have been closed up until such time as railway connection has been made with them.

Up to December 31st, 1913, about 40 per cent. of the Town of Frank had been moved from the danger zone under Turtle Mountain. As the Canadian Coal Consolidated, Ltd., which was operating the mines at Frank went into liquidation some time ago, very little moving has been done. I understand, however, that it is the intention to have this company reorganized and to have mining operations commenced again, when it is likely that the remainder of the town will be moved.

In the lignite field, 54.35 per cent. of the total output was mined by machinery. No coal-cutting machinery is used in the bituminous or anthracite coal fields.

The branch line from Edson on the main line of the Grand Trunk Pacific Railway into the mines operated by the Mountain Park Coal Co., Ltd., was completed and is now in operation, so that a much increased output will be obtained from those mines during the present year. The coal obtained from this part of the country is a high grade steam coal and compares favourably with any coal in Western Canada.

The Pembina Coal Co., Ltd., which has connections with the main lines of both the Grand Trunk Pacific Railway and the Canadian Northern Railway has completed a plant during the past year which is capable of producing from 1,000 to 1,200 tons of coal per day. The Gainford Collieries, Ltd., which is situated on the main line of the Grand Trunk Pacific Railway is at present erecting a plant which is capable of producing 1,000 tons per day. These two last mentioned mines are situated about 50 miles west of Edmonton and produce a domestic coal of high quality.

A considerable amount of coal mining has also been done in the neighborhood of Edmonton by means of the stripping process. This process is removing the sur-



face clay by means of a steam shovel, after which the coal is quarried and loaded direct into the railway cars.

The line at present being built from Red Deer into the mines being developed by the Brazeau Collieries, Ltd., will be completed about March 1st, 1914, so that another steam coal field with a large area will be opened up. A modern and up-to-date plant capable of handling 1,500 tons per day is being erected by this company.

A large amount of development has also taken place during the past year in southern Alberta and a number of plants of modern design have been installed.

#### Coal Output of Alberta During 1913.

	Tons.
Lignite Coal .....	1,763,225
Bituminous Coal .....	2,374,401
Anthracite Coal .....	168,720
Coal used in coke production .....	104,012
Coke produced .....	65,167
Briquettes produced .....	130,861

The above table shows there has been an increase in the output of lignite coal 31.44 per cent. over the year 1912, an increase of 23.25 per cent. in the output of bituminous coal, over the year 1912 and a decrease in the output of anthracite coal of 5.52 per cent. under the year 1912.

#### Summary of Statistics for the Year 1913.

Number of mines in operation, 289; number of new mines opened, 45; number of mines abandoned, 72; number of tons of coal mined, 4,306,346; number of tons of coke produced, 65,167; number of tons of briquettes produced, 130,861; average number of persons employed inside mines, 5,837; average number of persons employed outside mines, 2,231; average number of persons employed inside the mines during the month of December, 6,610; average number of persons employed outside the mines during the month of December, 2,253; number of separate accidents causing loss of life, 25; number of deaths caused by accidents inside the mines, 24; number of deaths caused by accidents outside the mines, 4; number of serious accidents outside the mines, 9; number of serious accidents inside the mines, 50; number of slight accidents inside the mines, 71; number of slight accidents outside the mines, 13; number of mine managers certificates issued, 6; number of pit boss certificates issued, 19; number of fire boss certificates issued, 14; number of examiners certificates issued, 7; number of mine rescue certificates issued, 51; number of persons holding first class certificates, 151; number of persons holding second class certificates, 170; number of persons holding third class certificates, 301; number of persons granted Provisional overman's certificates, 103.

On September 17th, 1913, Rules for the Installation and Use of Electricity in or about Mines were passed by Order-in-Council and went into effect on that date. According to the returns received from the different mines electricity was used at 29 mines in 1913. The Crow's Nest Pass was the most active district in this respect during the year.

The Rules for the Installation and Use of Electricity in or about Mines require a return to be made to the Department on or before January 21st of each year, giving the size, type and any other particulars which may be required, of electrical apparatus in use above and below ground in such mines as are governed by the provisions of The Mines Act. A summary of this return as regards the horse-power of electrical apparatus in use is given below:

District.	Above Ground H.P.	Under-ground H.P.	Total H.P.
Crow's Nest Pass.	2,246.5	260	2,506.5
Lethbridge. . . . .	1,235.5	417	1,652.5
Calgary. . . . .	262	...	262
Edmonton. . . . .	485.9	470	955.9

During the year there was only one accident in connection with the use of electricity reported. This accident, which was fatal was due to the attendant in charge of the power plant at the Bellevue mine operated by the West Canadian Collieries, Limited, receiving an electric shock which resulted from a leak on the machine. The accident took place before the rules became effective and could not possibly have occurred if these rules had been in force and had been complied with.

The scale of wages paid in the province during the year 1913 remains the same as it was at the end of the year 1912, and is as follows:

**Outside Wages**—Fire bosses, \$110 to \$115 per month; bottom man, \$2.89 per 10 hour day; slate pickers (boys), \$1.37 per 10 hour day; slate pickers, (men), \$2.47 per 10 hour day; car oilers (men), \$2.47 per 10 hour day; car oilers (boys), \$1.65 per 10 hour day; tally boys, \$1.37 per 10 hour day; teamsters, \$2.89 per 10 hour day; blacksmith, \$3.85 per 10 hour day; blacksmith's helpers, \$2.90 per 10 hour day; power-house engineers, \$3.85 per 12 hour day; power-house engineers, \$3.40 per 8 hour day; fan men, \$2.90 per 12 hour day; hoisting engineers, \$3.20 per 8 hour day; hoisting engineers, \$3.78 per 10 hour day; hoisting engineers, \$4.40 per 12 hour day; tail rope engineers, \$3.63 per 8 hour day; tail rope engineers, \$3.85 per 10 hour day; endless rope engineers, \$3.30 per 10 hour day; box car loader engineer, \$3.40 per 10 hour day; tippie engineer, \$3.40 per 10 hour day; screen engine tender, \$2.65 per 10 hour day; locomotive engineer, \$3.40 per 10 hour day; locomotive switchman, \$3 per 10 hour day; fireman, \$2.89 per 8 hour day; fireman, \$3.85 per 12 hour day; fireman's helper, \$2.65 per 10 hour day; railway car helper, \$2.60 per 10 hour day; tippie dumper (man), \$2.89 per 10 hour day; tippie dumper's helpers, \$2.64 per 10 hour day; tippie dumper (boy), \$1.65 per 10 hour day; top eagers, \$2.64 per 10 hour day; car repairers, \$3.40 per 10 hour day; car repairer's helper, \$2.90 per 10 hour day; breaker engineer, \$3.40 per 10 hour day; fan fireman, \$3.40 per 12 hour day; lampman (depending upon number of lamps and skill of man), \$2.47 to \$2.89 per 8 hour day; lampman (depending upon number of lamps and skill of man), \$2.47 to \$3.40 per 12 hour day; machinists, \$3.40 to \$3.85 per 10 hour day; machinist's helper, \$2.90 per 10 hour day; ashman, \$2.50 per 10 hour day; wiper (man), \$2.89 per 12 hour day; ashman, \$2.89 per 12 hour day; coupler (man), \$2.47 per 10 hour day; coupler (boy), \$1.65 per 10 hour day; breaker oiler, \$2.89 per 11 hour day; washer or tippie oiler, \$2.89 per 11 hour day; breaker picker boss, \$2.89 per 10 hour day; timber framer, \$3.40 per 10 hour day; timber sawyer, \$2.64 per 10 hour day; box car shoveler, \$2.89 per 10 hour day; breaker platform boss, \$2.89 per 10 hour day; breaker platform men, \$2.60 per 10 hour day; breaker screen men, \$2.47 per 10 hour day; rock bank men, \$2.47 per 10 hour day; dirt bank men, \$2.47 per 10 hour day; finisher after box car loader, \$2.47 per 10 hour day; all other outdoor labor, \$2.47 per 10 hour day.

**Bee Hive Coke Ovens.**—Levelling and drawing (6½ ton charge) per oven, \$1; levelling and drawing (5 ton



charge) per oven, 80c.; loading into box or open cars (over 200 tons per month) per ton, 17c.; loading into box or open cars (less than 200 tons per month) per ton, 16c.; steam locomotive engineer, \$3.40 per 10 hour day; motorman, \$3.18 per 10 hour day; larryman, \$2.47 per 10 hour day; plasterers, \$2.47 per 10 hour day; carters and cleaners, \$2.47 per 10 hour day; all other labor, \$2.47 per 10 hour day.

**Belgian Coke Ovens (per 10 hour day).**—Ram engine man, \$3.40; chargers, \$2.89; clayers, \$2.89; drawers, \$2.89; loaders, \$2.60.

**Briquette Plant (per 12 hour day).**—Engineer, \$3.86; briquetter, \$3.97; briquetter's helper, \$3.40; tar melter, \$2.89; laborers, \$2.89.

**Inside Wages (per 8 hour day)**—Shotlighter, \$3.30; bratticeman, \$3.30; bratticeman's helper, \$2.75; timberman, \$3.30; timberman's helper, \$3.75; tracklayers, \$3.30; tracklayer's helper, \$2.75; motorman, \$3.05; motorman's helper, \$2.75; locomotive engineer, \$3.05; locomotive switchman, \$2.75; drivers, \$3.03; drivers (wet places), \$3.30; drivers (spike team), \$3.50; couplers (men), \$2.75; couplers (boys), \$1.65; switch boys, \$1.37 to \$1.65; door boys, \$1.10; rope riders, \$3.03; main and tail rope riders, \$3.30; pushers, \$2.75; buckers, \$2.75; miners, \$3.30; miners (wet places), \$3.75; rock miners, \$3.75; timber handlers, \$3.03; laborers, \$2.75; eagers, slope and incline, \$2.75; eagers, shaft, \$3.30; machine men, \$3.75; machine men's helper, \$3.30; pumpmen, \$2.75; pumpmen (Dept. Nat. Resources C.P.R.), \$3.20; hoistmen, \$3.03 to \$3.30; drivers (boys), \$1.65 to \$2.75; grippers, \$2.75; grippers (boys), \$1.65 to \$1.75; pipe fitter's helpers, \$2.75; pit carriers, \$1.37 to \$2.75; clutchmen, \$3.30; rollermen, \$2.75; loaders, \$2.75; miners on contract average from \$3.50 to \$6.00.

This scale of wages is taken from an agreement made with representatives of approximately seventy per cent. of the men employed in mines in the Province and went into force on November 17th, 1911, and will continue until March 31st, 1915.

### MINERAL EXHIBITS AT PANAMA-PACIFIC EXPOSITION.

The exhibits in mines and metallurgy at the Panama-Pacific International Exposition will be many and diversified. The Palace of Mines and Metallurgy occupies one of the corners of the great central rectangular block of main exhibit palaces of the exposition, and was erected at a cost of \$359,445. It covers an area of 252,000 sq. ft.

The mining exhibit is divided into five separate groups consisting of the equipment and processes of working mines, ore-beds and stone-quarries, minerals and stones and their utilization, mine models, maps and photographs, metallurgy, and literature of mining and metallurgy. Working models will be used to an unusual degree, thus increasing the interest and the educational value of the exhibits.

Equipments and methods of geological surveys, prospecting, assaying, drilling and cutting, explosives, timbering and equipment and processes for underground handling are all demonstrated. Machinery and appliances for draining mines, ventilating, and equipment and methods for mine safety and rescue, make up another group. Minerals and stones are given unusual attention. Building materials, clays, pumices, grindstones, fire-clays, asbestos, and gems and precious stones are shown. Mineral waters and mineral paints also come under observation in this department. Mineral fertilizers, fuels, luminants, including petrol-

eum and its products, asphalt and artificial mineral products are also displayed.

The group devoted to mine models, maps and photographs, will hold especial interest for the layman. Many of these models will be working demonstrations. Under metallurgy is found the equipment, methods and processes used in handling ores, the treatment of the same and their by-products, the manufacture and use of refractory materials for metallurgical purposes. Several classes are devoted to the display of iron-working in all its branches. Smelting, plating, alloying, galvanizing and electroplating are among the processes demonstrated.

Under the heading of literature of mining and metallurgy are statistics relative to geology, mineralogy, paleontology, quarrying, mining, mine accidents, metallurgy, the manipulation of mineral products and the development of water resources.

The exposition as a whole, stands to-day 95 per cent. completed and there can exist not the slightest doubt but that the opening date will find all in readiness. Many of the larger exhibits are now being installed, the forty-three states and forty foreign nations which will be represented at the exposition are rushing the construction of their state buildings and national pavilions. Many of these are already completed and most of those remaining are well under way.

### INTERNATIONAL ENGINEERING CONGRESS, 1915.

A report having recently been circulated to the effect that the International Engineering Congress was to be abandoned, the committee of management desires to state that this is not correct, but that the Congress will be held in San Francisco as scheduled, from September 20th to 25th, 1915.

In view of the conditions now prevailing in Europe, the governing bodies of the five National Societies under whose auspices the Congress is to be held, have recently given careful consideration to the feasibility of holding the Congress and to the probability of its success, with the result that each body has unanimously confirmed its original pledge to support the Congress. The Committee of Management is actively proceeding with arrangements, which are now well advanced, for meetings on the scheduled dates and for the publications of the transactions.

The Committee of Management is in receipt of a sufficient number of communications from various foreign countries throughout the world, including those located within the war zone, to indicate that a large majority of the papers originally requested for presentation at the sessions of the Congress and publication in its transactions will be handed in on time, and that the Congress will be truly international in character.

A detailed circular of information regarding the publications of the Congress has been prepared by the Committee and will be sent upon application to the Secretary, in the Foxcroft Building, San Francisco, California.

### GEOLOGICAL SURVEY PUBLICATIONS.

The Geological Survey has issued three memoirs recently: No. 41, The "Fern Ledges" Carboniferous Flora of St. John, N.B., by Marie C. Stopes; No. 51, Geology of the Nanaimo map area by Charles H. Clapp; No. 54; annotated list of flowering plants and ferns of Point Pelee, Ont., and neighboring districts, by C. K. Dodge.



## TRADE UNIONISM AND THE WAR

By F. W. Gray.

Shortly after the outbreak of war, reference was made in these columns to a resolution presented to the Trades and Labor Council of Sydney, Cape Breton, protesting against the formation of a city regiment, because, in the words of the resolution, such a step would lead "to the abuse of militarism." To the credit of the Sydney Council the resolution does not appear to have been adopted, but the significance of the matter is that this idiotic resolution was evolved at a date which coincided with, or immediately followed, the visit to Sydney of the President of the Trades and Labor Congress of Canada.

A meeting of labor men was held in Montreal early in November, and was addressed by J. Sedden, the President of the Trade Union Congress of Great Britain, who claimed, with accuracy, to represent three million British trade unionists. The object of the meeting was to raise funds for the relief of the trade unionists of Belgium, an object sufficiently laudable it might be thought to engage the sympathy of Canadian trade unionists. Mr. Sedden must, therefore, have been rather unpleasantly astonished when the President of the Trades and Labor Council of Canada arose in the meeting and—the writer quotes from the *Montreal Star*—"made a sweeping arraignment of Sir Edward Grey as being equally guilty with the Kaiser for the war." Fortunately, however, the President of the Trades and Labor Council of Canada is not a Canadian—being, distressing to admit, a Scot from Edinburgh—nor does the clumsily-named and high-sounding organization of which he is President represent Canadian trade unionists.

A prominent Nova Scotian trade unionist, who recently visited Toronto, made the statement that he met four men in Toronto who took an unpatriotic view of Great Britain's attitude in the present war, and each of these men was born in Great Britain. These gentlemen, it may be deduced, left their country for their country's good, but it is a great misfortune that they should have selected Canada as a residence. We also could spare them.

The moment does not seem inopportune to set forth a few candid statements regarding the trend of trade unionism in Canada, particularly that type represented by the Trades and Labor Congress of Canada. This body lays great stress on its international affiliations, that is affiliations with labor unions in the United States. By reason of the extreme disproportion between the membership and wealth of the labor organizations of the United States in comparison with those of Canada, all such "affiliations" must necessarily be of the variety known as "jug-handled", and must be characterized by the dominance of the United States influence. Now a great many of the features of trade unionism across the line are altogether alien to Canadian ideals, having arisen out of unfortunate economic conditions which do not exist in Canada, and which, moreover, cannot exist side by side with British laws and institutions. One of the organizations comprising the Trades and Labor Congress of Canada is responsible for the incredible "labor war" in Colorado, which has required President Wilson's personal intervention. This same organization caused during the recent Vancouver coal strike the worst excesses that ever took

place in a strike in Canada, and, but for the good sense of the local populace, would have caused similar excesses in the Nova Scotia coal strikes of 1909 and 1910. Every endeavor was made to introduce the methods which have characterized every recent coal strike in the United States, amounting actually to a state of civil war deliberately brought about and designedly fostered by the United Mine Workers of America. In almost every U. M. W. A. strike of recent years, both in Canada and the United States, it has been found necessary to call out the militia troops, and in some cases the regular army troops, to fight pitched battles. A brief survey of these happenings will reveal a loss of life and property of astonishing proportions.

With affiliations of this nature, it is not surprising, as the writer has previously pointed out, that the Trades and Labor Congress should object to the militia. The militia, it may be inferred, interferes with their own particular brand of "militarism."

It is, however, disconcerting to discover that the men who purport to lead Canadian trade unionism are disloyal, for any Briton who questions the justice of Britain's attitude, or attempts to impugn the integrity of the Foreign Minister, at the present time, is disloyal. There was a moment, before Germany declared war on Britain, when discussion on this point was permissible, but the man who attempts to-day to weaken the position of our political and military leaders by accusations concerning matters precedent to the outbreak of hostilities, betrays first his ignorance, and then a mean-souled disloyalty which renders him undesirable as a citizen and a danger to the common weal if he holds the office of a labor leader.

There were two possibilities by which Britain might have averted war. The first is a very debatable one, but it has been discussed in the reviews, namely, that war might have been avoided had Britain in the earlier stages of the diplomatic negotiations made it plain that she was ready to go to war. But everyone must agree that in such a case she would have been regarded as the aggressor, and that her attitude might not, even under these circumstances, have prevented the calamity of war. The other possibility was to refuse to intervene in defence of Belgian neutrality, and no honorable man will wish to discuss this possibility. Had the President of the Trades and Labor Congress of Canada occupied the post of Foreign Minister, perhaps the world might have been saved its present agony, and it would be interesting to hear from this hitherto buried statesman how he would have arranged matters.

It is refreshing to turn from the contemplation of disloyalty to the utterances of Mr. Sedden who, doubtless much to his surprise, found it necessary to defend the Foreign Minister against the criticism of a man whose official title would imply that he represented the trade unionists of the Dominion of Canada. Mr. Sedden referred to the manifesto issued by the Parliamentary Committee of the Trade Union Congress of Great Britain, "appealing to the trade unionists to stand united in defence of the liberties won by our forefathers." Mr. Sedden attributed the ready response to the call for recruits in Britain to this manifesto, and it is a tribute, not only to the inborn patriotism of the British workman, but to his hard common



sense also, that he realizes how great are his liberties and privileges under the Union Jack.

The trade unionist in Great Britain has reason to love his country. Not that he would not love her under less favorable circumstances, but where would he find a better country? Look over the record of legislation in recent years. Has there ever been so sustained an attempt at amelioration of the condition of the workers, at equitable representation and taxation, as is represented by the enactments of the British House of Commons in the past ten years? The trend of British legislation has been called socialistic, stigmatized as class legislation, as the crudities of the demagogue and the enthusiastic but impractical social reformer. But these self-same crudities are now accepted and established features in the national life, and the "wicked and socialistic" laws of ten years ago are to-day the sober stuff of national practice and are so woven into the warp and woof of everyday life that they can nevermore be taken out. The pending struggle will show on how solid a foundation the loyalty of Great Britain's masses rests. They know that they themselves, by the power of their parliamentary representation, have largely brought about the legislation which has so increased their happiness, and they realize further that on them also devolves the privilege and the duty of defending their constitutional liberties—and, despite the ravings of men of the type of Kier Hardie, and his feeble imitator, the President of the Trades and Labor Council of Canada, these British workmen will die to a man before they will relinquish their British citizenship and all that goes with it. Many of them have already made that supreme and final sacrifice, and be it remembered that when the workman gives himself to fight his country's battles, he gives his all, and no man can do more than that.

It would be a libel on the trade unionists of Canada to suppose that they differed in this respect from their comrades in the Old Country itself, and there can be little doubt that they will repudiate the leadership of men who by their words and actions prove themselves recreant and disloyal in this, the supremest hour of the British Empire and the Anglo-Saxon race.

There is a sentence in the manifesto of the Parliamentary Committee of the Trade Union Congress of Great Britain which has become historic, because it epitomizes the feeling of intelligent British trade unionism. The sentence reads: "Upon the result of the struggle in which this country is now engaged, rests the preservation and maintenance of free and unfettered democratic government." The words "this country" in the sense in which they are here used mean the British Empire, the unexampled, glorious, God-given heritage of a free people, which the trade unionist, as part of an indissoluble whole, intends shall be handed down unimpaired to his son, and to his son's sons.

### COMMISSION OF CONSERVATION.

That the conservation movement has made distinct progress during the past year is clearly indicated in the "Fifth Annual Report" of the Commission of Conservation, which has just been issued.

In his annual address, the Chairman of the Commission, Hon. Clifford Sifton, covered the Commission's activities with respect to waters and water-powers, minerals, public health, agriculture, fisheries and fur-bearing animals and forests, indicating clearly and suc-

cinctly a number of the problems that had been grappled with and the advances that had been made in their solution.

With respect to water-powers, lengthy reports are presented covering the work in connection with the water-power surveys carried out in Western Canada. Two volumes will be issued later giving the results of these surveys and will prove of great value to those who are interested in the development of the water-powers of Canada.

The Commission's Committee on Minerals has been further strengthened by selecting as chairman, Dr. Frank D. Adams of McGill University. Dr. Adams is an outstanding authority on the minerals of Canada, and his assistance will be of great value to the Commission. The report contains an excellent review by Mr. W. J. Dick, mining engineer of the Commission, on the "Importance of Bore-hole Records and the Capping of Gas Wells."

Several aspects of the problems of public health are dealt with in the report by well-known authorities. Dr. Hodgetts, in a brief address, summarizes the work of the Committee on Public Health, and, in addition, presents reports on such vital problems as "Infant Mortality," "First Aid to the Injured," and the work of the City Planning Conferences held in Chicago and Boston in 1913. Mr. G. Frank Beer, president of the Toronto Housing Co., develops at some length the housing and city planning question in Canada, with especial reference to the work of the Toronto Housing Co., and Colonel J. H. Burland outlines the legislative requirements for town planning.

The work of the Committee on Lands is described by Mr. F. C. Nunnick, the Commission's Agriculturist, who pays especial attention to the progress of the experiments with the growing of alfalfa in Quebec. Mr. Nunnick also describes in detail the Commission's "Agricultural Survey" for 1913, showing in concise form the farming conditions in the several provinces as ascertained by the Commission's investigators. Dr. James W. Robertson and Mr. John Fixter describe the work of the illustration farms of the Commission.

Mr. J. Walter Jones follows in detail the progress in fur-farming in Canada during the past year. The work of the Committee on Fisheries was confined, during 1913, chiefly to the development of the oyster industry. Hon. A. E. Arsenault describes the new method of leasing oyster beds in Prince Edward Island. This method was advocated by the Commission two years ago and will do much to regenerate the oyster industry in the Maritime Provinces. An exceedingly interesting paper on the "Protection of Migratory Birds" is given by a leading American authority, Mr. W. S. Haskell, who urges Canada to join with the United States in providing sanctuaries for these birds.

Considerable advance has been made in the conservation of forests during the year. The Commission has co-operated with the Board of Railway Commissioners and the several Provincial and Federal forest services concerning the prevention of forest fires, with the result that much has been done to prevent forest fires along railway lines especially in Western Canada. In addition to the report of the chief forester, Mr. Clyde Leavitt, there are addresses on forestry by Dr. B. E. Fernow and Mr. R. H. Campbell.

The report contains a number of splendid illustrations and gives in concise form much information that is of value to all Canadians interested in the conservation of our natural resources.



## REPORT ON HILLCREST DISASTER

The report of the Commission appointed for the investigation and enquiry into the cause and effect of the disaster which took place at the Hillcrest coal mine, in southwestern Alberta on June 19, 1914, has been issued. The single member of the Commission was Mr. Justice Carpenter, who commenced hearing evidence on July 2. In his letter of transmissal the Commissioner states that "all the evidence available was taken, and what might be said to be a fairly thorough inspection of that part of the mine where the explosion was supposed to have occurred was made by the Commission. The report has been delayed owing to not having received the result of the tests of coal dust that were to be made by the United States Bureau of Mines, which tests it was agreed by counsel should be taken into consideration in making this report."

At the time of the explosion there were 235 employees of the company in the mine. Of those, 189 perished.

In the introductory paragraphs of his report the Commissioner observes: "The scope of this enquiry was by the terms of the Commission to determine as far as possible the cause and effect of this disaster. To follow out the objects of the enquiry, the possible causes of an explosion in a mine of this kind have first to be considered. It is then necessary to arrive as far as possible at the actual condition of the mine immediately prior to the explosion both in regard to the ventilation of the mine, the presence of gas, the condition of the mine in regard to dust and the character of that dust as regards explosiveness, and any other conditions that might give rise to or contribute to the cause of the explosion. It is also necessary to consider what care the officials of the mine had exercised prior to the explosion, both in the supervision of their employees and generally in the operation and working of the mine. Finally the nature and seat of the explosion, if possible, must be determined."

The Commissioner, in his comments on the evidence and the circumstances attending the disaster first states that the possibility of a blown-out shot having originated the explosion may be eliminated from the enquiry as a cause. Then, as no naked lights were allowed, there remained the question of a defective safety lamp, having been the cause, which though a possibility was not regarded as a probability. No conclusion could be arrived at regarding a fall of rock having caused sparks. Ignition from the sparking of electric wires or motors was rejected as the cause. Ventilation of the mine was dealt with in greater detail than other matters, and the conclusion was the men who gave evidence were of one opinion, namely, that the ventilation was good so far as their own particular working places were concerned. The presence of gas in the mine was also somewhat fully considered; also that of dust. After having reviewed these various matters the Commissioner proceeds:

"Apart from the matters I have already dealt with, there does not appear to be anything in connection with the management of the mine, nor in the care taken by the company in its operations that could have led or contributed in any way to the disaster.

"The initial cause of the explosion does not appear to be ascertainable. I have, almost at the outset of this report, mentioned the ordinary causes of ignition of gas in a mine. Shot-firing having been eliminated, the explosion must of course have originated from the

ignition of gas, but by what means there has been absolutely no suggestion. Certain of the ordinary causes of ignition have been or may be eliminated here, but there is no means of fixing upon which of the remaining causes it was that started the explosion.

"With one exception, the expert witnesses all were of the opinion that it was a gas explosion augmented by the ignition of dust and that dust played a considerable part if not the greatest part in the explosion. The finding of a very considerable amount of coked coal dust was one of the facts that was relied upon by those who advanced this latter theory and in view of the result of the tests of the dust, I think this view is the most reasonable one to adopt.

"It is impossible also to determine the seat or place of origin of the explosion. In certain parts of the mine it can be said that the explosion did not originate, but apparently the place where it did originate cannot be determined.

"It will be seen from the foregoing portions of this report, that the course adopted by the management of the mine in relation to the ventilation thereof, and other matters closely related to the question of ventilation, was apparently either objectionable or at least open to criticism, but the evidence does not go so far as to show that this was responsible for the disaster.

"The only conclusion therefore, that I can arrive at, as a result of the whole evidence adduced at the enquiry is that the disaster was caused by an explosion of gas, the origin and seat of which is unascertainable, this explosion having been augmented by the ignition of dust through the mine."

The Commissioner made several recommendations "which it is submitted may lessen the extent of the danger that was shown to be attendant upon the operation of this mine." These related to constant direct supervision of mine fans; discontinuance of shot-firing until danger from dust in the mine shall have been considerably reduced, or that the men be withdrawn from the mine during such firing; that the recommendation of the coroner's jury that underground employees be searched at times for matches, pipes, and tobacco be adopted; that a plan of the ventilation system of the mine be provided, and that a definition of a district or split be agreed upon so that no difference of opinion may again arise.

### ALGOMA STEEL.

A meeting of the holders of the first and refunding mortgage 5 per cent. fifty-year sinking fund gold bonds of the Algoma Steel Corporation, Ltd., will be held on November 27, at the offices of the U. S. Mortgage & Trust Co., for the purpose of sanctioning a modification or compromise of the rights of holders by authorizing the company to pay interest on the bonds due October 1 last, April 1, 1915, October 1, 1915, and April 1, 1916, in scrip, exchangeable on or after December 1, 1916, for a like amount of said bonds, with an option to the company to pay interest in cash at any time.

There will also be authorized, through the trust company, an authentication and delivery to the company, upon request \$2,000,000 par value of the \$5,700,000 issue of the bonds in question.

The bondholders will likewise act upon assenting to a change in the deed of trust requisite to the release of the Lake Superior Corporation from its guarantee in respect to the interest on the bonds.



# PRE-CAMBRIAN CORRELATION FROM A LAKE SUPERIOR STANDPOINT\*

By C. K. Keith

(Continued from Last Issue.)

**A. C. Lane** (Boston)—Collins' paper has covered the decade of the introduction of the terms Huronian and Laurentian as divisions of the pre-Cambrian. In the decade between 1860 and 1870, first-class geologists like Credner, Brooks and Pumpelly followed the usage of the introducers of the terms and divided the pre-Cambrian (Vorsilurische, or Eozoic) into Laurentian and Huronian. It is a question of literary taste whether this well fixed usage, taken up by the great textbooks e. g., that of Dana, should be overturned and whether, if new wine be found, it should not be put into new bottles.

In all probability it will be found, if Newberry and Schuchert's theory that periods of geology are marked by world-wide cycles of sedimentation be true, that the Huronian as originally defined and mapped, covering the Animikie, contains three such cycles. In that case the Huronian may be divided into Animikean and two other periods. But why change the use of the term Huronian? This will lead to endless confusion. Give each of the three cycles and periods its own name.

Is it proved that, as Lawson implies, the "original Huronian" near Sault Ste. Marie contains no Animikie? My observations there do not convince me of this. It is also to be noted that the Animikie is more disturbed on the south shore of Lake Superior than the upper part of the "original Huronian."

**A. C. Lawson** (Berkeley, California), replying to Professor C. K. Leith, said that he had not ignored by implication the existing nomenclature and classification of the pre-Cambrian. On the contrary he had printed it in full and discussed it freely, pointing out its defects. The changes were urged not on the basis of short examination of the Rainy Lake district, with detailed mapping only along the water's edge, but after a careful re-study of the district and mapping on a field scale of a quarter-mile to the inch, involving numerous traverses, and after a review of the literature of the Lake Superior geology, to which abundant reference was made in his paper, particularly to the latest statement given in Monograph LII. of the U. S. Geological Survey. He exhibited a geological map of a portion of Rainy Lake on a scale of half a mile to the inch showing the evidence for his interpretation of the Archaean geology of that district, and stated that his detailed work in 1911 had substantiated the evidence set forth in his report of 1887. He did not claim that the evidence as to the reality and stratigraphic position of the Couteiching was new, but that it was true, that it had never been examined by his critics in the significant sections, and that it must be recognized whether it be new or old.

Mr. Lawson said that the real reason for the denial of the existence of the Couteiching below the Keewatin was the peculiarly dogmatic doctrine, promulgated by the U. S. Geological Survey, that no sediments occurred in the Archaean, that it was wholly igneous. This doctrine has in recent years been abandoned as untenable. Under its influence, however, it was first denied that the Couteiching rocks were metamorphosed sediments, and subsequently, when their sedimentary character could no longer be doubt-

ed, it was asserted that they were above the Keewatin, although the geologists who made this assertion never took the trouble to examine the sections at Bear's Passage and Rice Bay, which were described in the report of 1887 as proving the superposition of the Keewatin upon the Couteiching. Mr. Leith, he said, had advanced several formal reasons for the non-acceptance of the stratigraphic position of the Couteiching, but these were not worth discussing in view of the unchallenged and positive field evidence easily observable at Bear's Passage and Rice Bay. At Bear's Passage the stratification of the Couteiching is not confounded with the schistosity, the strata are not "standing nearly on edge;" they form a well defined anticline with flat lying strata in the axis and steepening dips on the flanks, passing beneath the Keewatin on both sides. On the west side they pass beneath the Keewatin at angles of from 20 to 30 degrees. The section is, moreover, easily accessible, and it is psychologically remarkable, to say the least, that the geologists who deny the relations there revealed should not have visited the section during their different visits to Rainy lake. Mr. Leith's statement that "one of the largest areas described as Couteiching is now admitted to be later than and unconformable upon the Keewatin" is erroneous, as is shown by the map at his side. A relatively small strip of the rocks mapped as Couteiching on Seine river was found to belong to a later series, and the Couteiching remains as mapped in 1887, with but little change.

As to the recognition of the post-Huronian granite batholiths as Algoman, a term co-ordinate with Laurentian, Mr. Leith agrees that it is highly desirable to restrict the term Laurentian to the pre-Huronian granites. But without a definite designation for the post-Huronian Archaean granites, which are now known to be very extensive, this restriction cannot be made, as current usage up to this time clearly shows. The reference for all granites of Archaean age to the Laurentian under the guise of present expediency, when it is positively known that they belong to two widely separated ages, obscures geological history and retards progress. The desirability of restriction of the term Laurentian being conceded, no further argument is necessary.

Mr. Leith's objections to the recognition of the Eparchaean Interval as a dominant fact in the classification of the rocks of the Lake Superior region do not weaken its importance. The fact that there is another profound unconformity at the base of the Huronian, the Epi-Laurentian Interval, is freely recognized in the paper, but emphasis has been laid upon the Eparchaean Interval, owing to the fact that Van Hise, Leith and others habitually slur it over and minimize its significance by making the terms Algonkian and Huronian straddle a great time break. If the Animikie strata, as everybody agrees, were laid down on "a remarkably uniform peneplain—a flat plane beveling alike hard and soft, resistant and non-resistant rocks" in the Mesabi, Animikie and Gogebie districts, it is clear that a large section of geological time unrepresented by sediments is involved, which finds no

\*A paper presented at the Toronto Session International Geological Congress, 1913.



expression in the geological scale if the interval is to be spanned by a systemic name like Algonkian or Huronian. The rocks properly called Huronian are certainly on the far side of that interval and the Animikie on the near side, and the obscurities of the south shore are no warrant for ignoring a large fact which is as clear as day on the north shore of Lake Superior. Mr. Leith's contention that the Epi-Laurentian Interval is of equal importance is agreed to in the paper which he criticizes, but no one has attempted to bridge that interval by a systemic name including rocks on both sides of it, since the Keewatin was segregated from the Huronian. The introduction of the "great confusion into the literature" which Mr. Leith deplores is not due to the recognition of the significance of the Eparchaeon Interval and the taxonomic consequences which flow from it; but is due rather to the unwarranted, unnecessary and vicious imposition of the term Algonkian upon the literature in such a way as to displace the term Huronian as a division of the Archæan, and at the same time blur hopelessly the geological record. The term Algonkian is well enough as a name for a system of pre-Cambrian rocks, but the only system to which it can apply is that embracing the Animikie and the Keweenawan, since on the far side of the Eparchæan Interval the term Huronian cannot be displaced.

The terms of the standard scale as set forth in his paper, Mr. Lawson claimed are expressions of geological fact. They represent major events in their ascertained sequence. Being the most complete and unequivocal sequence yet formulated, it is proper that it should be erected as a standard for purposes of comparison and correlation. The only debatable question is that of co-ordination, and his own view of that is expressed in the tabulation of the paper.

**Prof. Lane**—Did not Logan then describe these rocks as Cambrian?

**Dr. Lawson** replied that Logan in the *Geology of Canada*, 1863, did not class the Animikie as Huronian, but as a later series.

**C. K. Leith** (Madison, U.S.A.)—Dr. Lawson says he is glad to admit the existence of other unconformities possibly of the Eparchæan type. This is what we claim. Why then should the unconformity at the base of the Animikie be made the principal basis of classification and nomenclature. Any arguments advanced for the emphasis on one unconformity will apply equally well to the other.

**J. J. Sederholm** (Helsingfors)—The Eparchæan interval seems to correspond to the great break which exists in some parts of Fenno-Scandia between the Jatulian and its basement. There, as here, we place the upper limit of the Archæan at that break, but since the discovery of great thicknesses of Kalevian rocks, often directly underlying the Jatulian, I think we have less need of such a term as that proposed by Dr. Lawson.

I perfectly understand the reasons which have brought our Canadian colleagues to adopt the present use of the term Laurentian, but I continue to think that it might be better to give it up altogether. Many geologists have thought till lately that there was in the pre-Cambrian of northern Europe an oldest basement complex consisting mainly of gneisses and granites possibly older than all sediments. I once shared that opinion. But now we are aware that many of those gneissose and granitic rocks are younger than certain sedimentary schists of the same region and we

therefore try to map them with different colors according to their ages.

**A. P. Coleman** (Toronto)—The original Huronian was very carefully mapped by Logan and Murray, and was divided into upper and lower subdivisions. The Animikie was not included in it. The error of putting it into the Huronian was due to Irving's belief that the Animikie represented Logan's Huronian.

After careful study of the original Huronian I have not found any granites or gneisses penetrating them. Therefore I cannot agree with Dr. Lawson in defining the Algomian as granites and gneisses penetrating the Huronian.

**A. E. Barlow** (Montreal)—I am rather surprised that Dr. Coleman should maintain that there are no important batholiths later than the Huronian, for in his most recent work, *The Nickel Industry*, he mentions that the nickel eruptive, presumably of Keweenawan age, is cut by dykes of later granite, apophyses from and genetically connected with a batholith which occupies an area of many square miles in the Sudbury district. He further relates that the later olivine-diorite dykes, which the present speaker has always regarded as differentiates of the nickel eruptive, are cut by little dykes of granite. Dr. Coleman also states his belief that "this last eruption probably took place somewhere in Palæozoic time." May I then ask Dr. Coleman if this is not a fair and proper interpretation of his latest description of the geology of Sudbury district.

**Sir T. H. Holland** (Manchester), pointed out that some misunderstanding appeared to exist as to Logan's views regarding the relation of the Huronian to the rest of the pre-Cambrian of the Great Lakes region. Logan first divided the rocks of the area into five groups, drawing special attention to the great unconformity between the foliated and folded groups 1, 2 and 3 below and the simply folded formations 4 and 5 above. The lowest two groups afterwards became the Laurentian while the more certainly sedimentary formations above became known as the Copper bearing series. For the first ten years after the Survey commenced in 1846, Logan tried to fit the Canadian rocks into the standard scale of Europe and thus relegated the oldest unaltered local sediments to the Cambrian. But in 1857 he felt compelled to separate his group 3 under a separate name, Huronian, limiting the term to the folded sediments below the great unconformity, that is, below what were afterwards named the Animikie. There is no doubt whatever that Logan very clearly distinguished between the Huronian and the "Upper Copper-bearing series" or Animikie. But in summarizing the reports of his assistant, Murray, Logan made the error of referring to the Huronian at the mouth of the Kaministiquia river, instead of at the falls, which are some 20 miles from the shore of Thunder bay. This error became repeated in the *Geology of Canada* published in 1863, and numbers of geologists were consequently misled by supposing that the easily accessible rocks of Thunder bay represented Logan's original Huronian when, as a matter of fact, they belonged to the "Upper Copper-bearing series." Most of the subsequent confusion and controversy can be traced to this simple clerical error, as was pointed out by Dr. G. M. Dawson when the British Association met in Toronto in 1897.

The speaker agreed with Dr. Sederholm in objecting to the use of system names for intrusive batholiths, and he recommended the system introduced by him in India of recognizing by special names well de-



finer petrographical provinces among the Archaean intrusives. The recognition of a petrographical province implied an age as well as an area and they thus had in India the charnockite series, the Sivamalai series, the kodurite series, etc. These might or might not wholly or in part correspond to the Laurentian of Canada; no one could settle such a point, and nothing would be gained by attempting the impossible task of correlating the Archaean intrusives of widely separated areas; analogies could be recognized, but not equivalence of age.

**A. E. Barlow**—Before reaching a decision regarding the formation of any committee on pre-Cambrian classification and nomenclature I would like to make a few remarks. In the first place the geologists invited to join such a committee should be men of wide acquaintance with and interest in the subject. They should preferably have firm convictions, reached after years of critical examination and study in various regions where pre-Cambrian rocks are typically exposed. My experience with men of so-called judicial mind has been that they have no "mind" at all and are most concerned in trying to reach some compromised decision. Truth will not admit of compromise. The men, therefore, who are to compose such a committee should be chosen for fitness only, and not by reason of their official position. I oppose in the strongest manner any abandonment of the use of the term Laurentian at a time when we understand better than in the past its true import. The use of names to designate as "series" certain local developments of these old crystalline rocks, urged by Sir Thomas Holland, seems to me only to add to the complexity of the subject, for we know that the nepheline and other alkali syenites found in the Laurentian massif and which are comparable with Holland's Sivamalai series of India, are a peripheral expression of the more usual or prevalent Laurentian granites and gneisses. I am deeply grateful that Archaean geologists of all countries are in such close agreement on questions of interpretation and classification. At the same time I am in hearty sympathy with Dr. Lawson in his determined stand for world-wide recognition of the importance of batholithic intrusion as representative of time and area in geological history and his emphasis on the great lapse of time represented by the Eparchaean and other intervals.

**G. A. Cole** (Dublin), asked his Canadian colleagues to consider seriously whether, injustice to the original views and definitions of Sir Wm. Logan, the term Laurentian might not be abandoned, except as representing an opinion which profoundly influenced the reading of the Archaean succession all over the world. That reading having, in the progress of research, become greatly modified, the name Laurentian ceased to be desirable, as it could no longer be applied to the ancient stratigraphical horizons for which it was devised. Similarly, the greatly respected term Silurian, owing to various definitions given to it, had been abandoned by several European workers.

Professor Cole also pointed out that Dr. Strahan had naturally based his account of pre-Cambrian rocks in Ireland on Irish publications of the Geological Survey of the British Isles. These, however, were now some 20 years old and the views expressed in them had been departed from in many respects by geologists in Ireland at the present day. The gneiss of the northwest, for instance, was now known to be intrusive in the Lough Foyle (Dalradian) series, and it was to be regretted that the only official statement of this fact occurred, so far,

in two minor publications of the Department of Agriculture for Ireland. He felt that it was the duty of the Irish Survey, and thus his own duty, to rectify these matters at an early date.

**J. Horne** (Midlothian), expressed amazement not only at the divergences of opinion but at the contradictory statements that had been made regarding the facts of North American pre-Cambrian geology. He was of the opinion that names of formations might come to have broader significances than the conditions existent in the original locality would indicate. Thus the term Lewisian is now so used that the rocks in the locality where this name was originally applied are no longer very typical.

**Dr. Lawson** replying to Dr. Horne, said that his statement that the Huronian was cut by granites was based upon Professor Coleman's papers.

**A. P. Coleman**—Dr. Barlow has quoted Prof. Coleman as contradicting Prof. Coleman, and quite correctly. In earlier writings I followed the usual belief as to the Huronian. Since then new light has come, placing the Sudbury series, which is cut by the Laurentian, below the Huronian. This will explain to Dr. Horne the apparent contradiction.

**T. C. Chamberlin** (Chicago), stated briefly the grounds on which the pre-Cambrian is divided into Proterozoic and Archeozoic, to which allusion had been made. A portion of the pre-Cambrian sediments present the products of mature disintegration, while the earlier portions are usually characterized by partial or immature disintegration. The former are best typified by the great beds of quartzite, that imply the complete disintegration of large quantities of quartz-bearing rock and the subsequent assortment and reduction of its quartz particles. The shales and schists imply the same process, but in their metamorphosed condition they are less easily and safely distinguished from pyroclastic and other material of different origin. Mature disintegration implies some restraining agency that held the rock in place while the slow weathering process completed its work; otherwise the products of incomplete disintegration would have mingled with quartz and given an arkose or equivalent product. In the later ages the chief restraining agency was the mantle of vegetation, so that this view favors the existence of a vegetal covering of the land as far back as great terranes of quartzite occur. By hypothesis the classification thus comes to have a semi-organic basis; but this is not essential to the classification which is based on the dominant processes attending the sedimentation. The Proterozoic is thus made to include terranes that bear great quartzite formations. The earlier formations not so characterized are grouped into the Archeozoic.

**L. L. Fermor** (Calcutta, referring to Dr. Horne's paper presented at the morning session, pointed out that Dr. Horne had given a resume of the various opinions held on the Lewisian gneisses, Moine schists and Torridonian sandstones, but that he had omitted to mention what many were probably wishing to hear, namely, the equivalence of the Dalradian schists to the remainder of the Scottish crystallines. He asked Dr. Horne if he would kindly express an opinion on this point.

Dr. Fermor also referred to the interesting discussion on the nomenclature of the North American Pre-Cambrian rocks. He pointed out that the classification of the pre-Cambrian rocks of India advocated by Sir T. H. Holland had been prepared at a time when the classification of the American Pre-Cambrian was in a state of confusion. Since Holland's scheme had been put forward



it had been tested by the Indian Geological Survey and found to be of great use. The majority of officers of that department found that Holland's classification was peculiarly suitable to India. The speaker had never been able to understand why some such similar scheme should not also be applicable to North America. The great stumbling block had been the various statements prevalent as to the relation of the Laurentian to the other members of the Pre-Cambrian complex of North America. Prof. Lawson in his paper had now made these relations perfectly clear by separating the Algomian from the Laurentian batholithic rocks. The speaker thought that Prof. Lawson's paper would be received with great satisfaction by many Indian geologists.

## WORKMENS' COMPENSATION IN ONTARIO

Employers throughout the Province are now beginning to realize what a stupendous task lies before the Workmen's Compensation Board in administering the system which is to go into operation on the 1st of January. There is probably not a single employer in the Province who has not within the last few weeks been obliged to wrestle with one or more of the following questions:—

What about the office staff? Do the stenographers, accountants, etc., come under the Act? What if they are in the same building as the rest of the plant? What if they are on other premises just as dangerous? What if they are on premises not so dangerous? What about the manager? What if he rarely, or never, goes into the plant? What if he does go into the plant? What about the president, directors, etc., of an incorporated company? What if the president, directors, stenographers, office boys, etc., etc., are generally, or sometimes, engaged in work other than "clerical"?

What does "clerical" mean? Does it mean what the dictionary says, namely, "of, pertaining to, or characteristic of, the clergy, or a clergyman; suitable for the clergy; of or relating to a clerk or copyist"?

What about branch establishments? The Act provides that "employment shall include employment in any industry or any part, branch or department of an industry." What if a manufacturer has a wholesale or retail department or branch either on the manufacturing premises or elsewhere? What about branches outside the Province; employees injured outside the Province are in some cases entitled to compensation. Does this support the view that branches or departments outside the Province are under the Act?

As to persons engaged in "clerical" work and not "exposed to the hazards incident to the nature of the work carried on in the employment", it must be observed that the two qualifications must occur before the person is excluded from the Act. The work must not only be "clerical" but the employee must not be exposed to the hazard, and conversely, the employee must not only not be exposed to the hazard but the work must be "clerical."

The meaning of the word "clerical" that is to say, the legislative meaning—the meaning which the legislature (not the Retail Merchants' Association, or the drafting Commissioner or even the Cabinet) intended—is presumed to be the ordinary or dictionary meaning unless the contrary is shown. The root meaning referring to the clergy has been extended to cover matters generally connected with copying or writing, but it would be difficult if not impossible to maintain that a correct use of the word would include the salesmen, saleswomen, floor walkers, office and messenger

boys, porters, janitors, sweepers, scrubwomen and the indefinite variety of persons engaged for instance in a large department store or a wholesale warehouse.

—F. W. Wegenast, in *Industrial Canada*.

## CROWN RESERVE.

Under date of November 14, 1914, the Crown Reserve Mining Company issued the following notice to shareholders:

"The drainage of Kerr lake and the removal of the mud and clay during the year has demonstrated that the whole bed of the lake on the Crown Reserve property is a long narrow trough, instead of a gradual sloping ledge. The difficulty in removing this mud and clay has made it impossible to prospect the bed of the lake this season, although the work will be vigorously renewed next spring. No new orebodies have been discovered.

"The fall in the price of silver since the commencement of the war has also made it necessary to extract a larger proportion of high grade ore than heretofore to meet the expenses and dividends. The company has earned all requirements for expenses and dividends and assures the shareholders that the same rate of dividend can be earned and will be paid by the company for the balance of the present year, but owing to the foregoing facts it is the intention of the directors to recommend to the incoming board that the present rate of dividend be reduced."

The Kerr Lake Mining Company's portion of the bed of Kerr lake is a gradually sloping ledge, and most of it has been exposed and prospected. Numerous veins of good ore have been laid bare by removing the water and mud and the results are very satisfactory. The Crown Reserve Company's property lies lower and is more deeply covered with mud. Hence, it has not been possible this year to uncover it as the Kerr lake property has been uncovered. The Crown Reserve property being more heavily covered with mud is more costly to explore and takes more time. Not only is exploration costly, but prospects correspondingly poor, for the deeper the mud the thinner the ore-bearing conglomerate and the smaller the profit. However, the property is by no means worked out yet, and there is a considerable area yet unexplored.

## CANADIAN MINING CORPORATION.

Interim dividend for the six months ended September 30, 1914, of 6d. per share, less income tax, payable on the 25th inst. The earnings warrant a larger dividend, but on account of the general financial conditions and the heavy drop in the silver market the board of the Canadian company considers a conservative policy essential.

## MAGNESITE.

The Canada Gazette's announcement makes it clear that the Minister of Customs has been authorized to issue license on behalf of His Majesty permitting manufacturers using magnesite to trade with the enemy in respect of such magnesite, in any case where it is established that the materials are necessary for the maintenance of an important Canadian industry.

## PORCUPINE CROWN.

Porcupine Crown Mines, Ltd., has given notice that a dividend of 3 per cent. for the quarter ending 31st December, 1914, has been declared, payable on the 2nd January, 1915, to shareholders of record the 15th December.



## NATURAL RESOURCES OF PEACE RIVER COUNTRY

The Vancouver Daily Province recently published a lengthy account of the impressions of Mr. Martin J. Ravey, who late in October returned to Vancouver after having been travelling for nearly four months in parts of western Alberta and the Peace River country in British Columbia. Mr. Ravey left Vancouver early in July and first visited the part of Alberta in which prospecting for oil is being done. He says:

"After leaving the oil field I spent seven weeks on foot and raft in the country north-west of Edmonton, covering a distance of about 1,500 miles, going in via Grand Prairie, by way of Edson, through Pouce Coupe, Nose mountain, Pine River pass, on to Fort St. John and Peace River landing, down to Grouard at the head of Lesser Slave lake, and thence to Edmonton. Throughout the trip I took every opportunity of making detours off the main route. The natural resources of that country really surpass imagination. As in many other parts awaiting settlement, the chief thing lacking is means of transportation, but provision of this is practically assured. The lines of four companies coming from the east have already been surveyed and partly constructed, while communication with British Columbia is promised as soon as details shall have been completed in connection with the line that will eventually run from Bella Coola through Pine River pass to the heart of the Peace River country and thence on to Hudson bay. Government surveyors who have reported on the district are agreed that this route will afford the shortest way with the lowest grade for all products of the great North-West, which products will, in a few years, have to find an outlet to the markets of the world via a Pacific Coast port.

"This being practically a virgin country, a traveller naturally has to overcome many obstacles. The Government wagon road between Edson and Grand Prairie, a distance of roughly 240 miles, is fairly good in places, but has suffered from exceptionally heavy freighting between those points. Despite those obstacles, though, the settlers are all highly pleased with the prospects. Being sparsely timbered, none of the land off the main wagon road presents any difficulties as far as clearing goes; in fact, the timber on it will be an advantage to those going in to build up their future homes, much of it being suitable for fencing and for lumber for building, while the remainder will provide fuel for many years to come. . . . Horses and cattle are able to forage for themselves until early in January, and the farmer has no difficulty in getting all the winter feed necessary for the time—ten weeks at most—during which it is necessary to give the stock feed and protection. It is a curious fact that the temperature at this altitude is due to the low passes in the Rocky mountains, which offer little, if any, resistance to the Chinook winds arising from the Japanese current, striking the Pacific coast due west of here."

Mr. Ravey gives much information concerning the natural vegetation growing in profusion, game and fur animals, fish, wild fruits, etc., and adds: "In addition to all these valuable resources awaiting the coming of the settler, there is much mineral wealth. Coal, gas and oil are known to exist. The whole country is underlain with coal measures, and at various places along the banks of the rivers settlers can collect large blocks of float coal, so all they have to do is to haul it to their cabins to provide a fuel supply. During my

journey I took samples of good anthracite, while bituminous and lignitic coals underlie millions of acres of the easterly part of the Peace River country."

Again, Mr. Ravey says: "In addition to the farming prospects, minerals, oil, coal and gas are found here in commercial quantity. Along the stream and river banks outcroppings of lignite and bituminous coal are to be seen, while in the foothills good anthracite has been found and only awaits development. Coal areas have already been secured by several railway companies interested in the district, and I was told that United States capitalists who have received encouraging reports intend spending much money here next year. As to gas, I should say there is far more in the Peace River country than they have in the fields of Alberta. . . . The general conditions for oil are favorable in this part of the country. From geological reports it will be seen that the underlying strata is not so broken as it is in parts farther south, the contention being that at the time of the upheaval of the Rockies the disturbance in these parts was not so violent, consequently the strata running east of those mountains is thrown into undulations suitable for the accumulation of oil."

### ANALYSES OF U. S. COALS.

The United States Bureau of Mines has just issued a small edition of Bulletin 85, "Analyses of Mine and Car Samples of coal collected in the fiscal years 1911 to 1913," by Arno C. Fieldner, Howard I. Smith, Albert H. Fay and Samuel Sanford. The present bulletin presents analyses and descriptions of samples of coal collected from many mines throughout the entire country. In order that the material in this bulletin may be made to supplement that presented in Bulletin 22, "Analyses of Coals in the United States," the same plan of geographical classification has been followed, the analyses and descriptions of the samples being grouped in alphabetical order according to the state, county, and town near which the mines or prospects sampled are situated.

Bulletin 22 was said to be the most comprehensive publication ever issued on the coals of the United States and the new bulletin is an extension of that work. So great was the demand for Bulletin 22 the free edition was exhausted a few weeks after its issuance. At the present time the only way to obtain a copy of Bulletin 22 is through the Superintendent of Documents, Government Printing Office, Washington, D.C., who sells the publication at eighty-five cents.

In Bulletin 85 are chapters on the collection of samples, the method of mine sampling followed by the Bureau of Mines, the relation of mine samples to commercial shipment, methods for the determination of moisture, ash, volatile matter, fixed carbon, and sulphur. Copies of this bulletin may be obtained as long as the free edition remains in stock by addressing the Director of the U. S. Bureau of Mines, Washington, D. C.

### YUKON FROZEN UP.

Fairbanks, Nov. 11.

The Yukon river was frozen over at Tanana yesterday morning. The last boat of the year left here September 25. The freeze-up on Chena Slough took place October 25. The lower Yukon is still open to navigation. The gas schooner Silver Wave left Nome Monday with mail for the States. The weather here is extremely moderate, with no snow.



# THE SAFETY MOVEMENT IN THE LAKE SUPERIOR IRON REGION\*

By Edwin Higgins

It is the purpose of this paper to set forth the relation and functions of the various organizations and institutions engaged in the promotion of safety in the iron mines of the Lake Superior region; also to indicate the value of this work. Ten to 15 years ago there was practically no organized safety work; the accident rate was high, excessively so in some districts, and dangerous practices and conditions existed in many of the mines.

During recent years, however, a gradual change for the better has been made. The chief causes of this change have been (a) public opinion, which has set the stamp of disapproval on the disregard for human life; (b) certain State laws which have made the operators responsible in dollars and cents for injuries to workmen; and (c) the humanitarian attitude of many of the operators, who have always decried the great loss of life in the mines.

To-day the Lake Superior region as a whole stands second to no other metal-mining district in the United States in its efforts to promote the welfare and safety of the miner. Dangerous practices in and about the mines are fast disappearing. The operators are ready and eager to adopt any expedient, rule, or device that holds forth a reasonable promise of reducing the hazard of the miner. To-day the value of a mine captain or shift boss is reckoned, not alone on his ability to "get the ore," but also on his capacity for reducing accidents. While the progress made has been remarkable, there still remains much to be done, for the accident records of the Lake Superior iron mines, while lower than those of the chief metal-mining regions of the United States, still compare unfavorably with those of the metal mines of practically all foreign countries.

## Organizations Engaged in Safety Work.

There are five organizations, or institutions, engaged in safety work in the Lake Superior region, viz.: The mining companies; county mine inspectors; co-operative range committees; Lake Superior Mining Institute; Federal Bureau of Mines.

While each of these bodies covers well-defined features of the work, their activities are correlated to a certain extent. The mining companies, primarily, are concerned with conditions in their respective mines, but they co-operate with and receive aid from the other agencies mentioned. The county mine inspectors, whose duty it is to see that the mines are operated with due regard to the State laws, are of great assistance to the mining companies in suggesting remedies for dangerous conditions or practices. The co-operative range committees, made up as they are of officials and employees of all companies operating within a given radius, are a benefit to the body of operators of their respective ranges. The committee of the Lake Superior Mining Institute on practices for the prevention of accidents, concerns itself chiefly with questions of safety of widespread interest; it of course has the co-operation of the other bodies interested. The Federal Bureau of Mines is chiefly active in training miners in the use and care of rescue apparatus and in first aid to the injured; also, it has conducted special investigations of certain problems having to do with safety and efficiency in the mines.

The unity of ultimate purpose and the strong co-operative spirit which have characterized the work of these five bodies have been important factors in the development of the conditions of to-day.

## The Work of the Mining Companies.

The bulk of the cost of the safety work has been and is still borne by the mining companies. In the main, their work has been to provide protective devices in and about the mines, and to educate the miners, by means of rules and regulations and various other methods, so as to enable them to protect themselves from injury. These objects seem easy of accomplishment, but there are obstacles of various kinds continually arising to hinder progress toward the desired end. Some of the most serious factors, most of which still exist to a greater or less extent, are the prejudice of the old-time miner or boss toward safety regulations; carelessness and lack of interest in safety work on the part of the miners, and even the bosses; and at times the scarcity of labor, which necessitates the employment of less skilled and oftentimes ignorant men.

The greatest problem to-day is not to secure knowledge of how safety work should be conducted, and what protective devices to use, but how to get the miner to use these methods and devices. Probably not 10 per cent. of the miners, if subjected to an examination, would show even a passing knowledge of the contents of the books of rules and regulations. Safety devices, provided at great expense, are often found removed from their places, or disregarded entirely.

The first problem of the mining companies was to provide for an organization to carry on the safety work, then to devise means of protecting the miner and of educating him and securing his co-operation in the prevention of accidents.

**Organization.**—Practically every mining company in the district now has some individual, or organization, whose duties relate solely to safety work. The larger companies have well organized safety departments. The following brief outline of safety organizations will indicate the usual procedure in this connection.

1. The mines covered by this organization are large and are all situated on one of the iron ranges of Michigan. The safety department is in charge of an inspector and it is his duty to inspect all mines as frequently as possible and submit reports and recommendations to the manager. Periodical trips are made in and about the mines by a committee of mine foremen consisting of three members, each of whom is selected from a different mine. The inspector accompanies this committee and incorporates its recommendations in a report. Another committee, having similar duties, is made up of workmen. The activities of this committee, however, are limited to the mine from which it is selected. The members are changed after each inspection, so that in time all employees are given a chance to criticize conditions in and about the mine.

All accident reports and safety recommendations are considered by a committee of mine superintendents, the head mining captain, master mechanic, assistant auditor, secretary of the pension department, safety inspector, and the manager, who acts as an ex-officio

\*Extract from a paper presented at Pittsburg meeting, A.I.M.E., October, 1914.



member. This committee meets once a month and confirms or rejects safety recommendations.

In addition to the above committees, there is one more made up of three mine superintendents. This committee investigates all fatal accidents and makes a report thereon to the manager.

2. The following form of organization is employed by a company operating both large and small mines at various scattered points. The department is under an inspector, who, with the assistance of three experienced miners, inspects each mine of the company at least twice a week. After a mine is examined, a report, including any recommendations thought necessary, is sent to the safety inspector. The safety inspector in turn makes a weekly report to the superintendent, who looks after all recommendations having to do with upkeep. The safety inspector makes a monthly report in triplicate to the manager in which recommendations are submitted for approval. Such recommendations are made out to the head of the department concerned. When approved by the manager, one copy is returned to the safety inspector, to be kept by him until the indicated improvement is made. Two copies go to the superintendent, who keeps one and sends the other to the head of the department concerned. On the completion of the improvement, the head of the department sends the recommendation back to the superintendent, who then destroys his copy and sends the indorsement of completion to the safety inspector. The safety inspector destroys his record and files in its place the report showing that the improvement has been made. This report is in the form of a printed card with blank spaces filled in according to the needs.

All company bosses and first-aid men meet once every two months to discuss all accidents that have occurred during the previous two months. The subjects discussed at these meetings are safety, sanitation, first aid and welfare.

3. A similar organization to that described above is maintained by a company operating small groups of mines at scattered points. A chief inspector is in charge of the safety work at all the mines. The foremen's safety committee, consisting of four foremen from the mines of a certain district, works directly under the chief inspector. This committee makes a trip every three months through all mines of the district. Its personnel is changed after each inspection trip. The committee reports to the inspector, who, in turn, includes this report in his recommendations to the superintendent; a copy of the report also goes to the general manager.

4. This organization operates in connection with one large mine. Inasmuch as the organization was changed after the safety work was well under way, it may be well to point out the various steps in perfecting the organization. An engineer was placed in charge of a department of efficiency and safety. He first made a thorough study of conditions in the mine and determined the principal causes of injury to the men employed. Finding that the greatest number of accidents occurred from falls of rock and ore, and from men falling down unprotected places in the mine, timber inspection was doubled and every place in the mine where it was thought that there was a possible chance for a fall to occur was timbered. All open places were protected by means of doors or gates. This movement effected an immediate and marked falling off in the number of accidents from the causes mentioned.

Finally, three assistants were added to the department and each one of them was given a certain feature of the work to look after. This was necessary on account of the magnitude of the operation. The safety and efficiency work then developed into daily inspection trips by all the members of the department. Reports were made by them to the head of the department, who considered recommendations made and obtained immediate action thereon through consultation with the manager. Lately these daily inspection trips have been abandoned; the members of the organization now average two or three trips a week through the mine.

Daily meetings, attended by the manager, superintendent, head of the efficiency and safety department, and mine captains, are held. Here all matters pertaining to efficiency and safety are discussed. As these meetings are held in the morning, it is possible to hear the reports of the shift bosses to the mine captain. In this way daily happenings and conditions in the mine receive prompt attention.

**Protective Methods and Devices.**—Under the head of protective methods and devices it may be said, in general, that the work proceeds along the following lines:

A study of mining and timbering methods with a view to greater safety.

A study of safe methods in every department of mine work.

The protection of dangerous places in the mine.

Protective coverings for all exposed parts of machinery.

Installation of safety devices in and about the mine.

The provision of such tools and appliances as will result in the maximum safety to the employees.

Installation of devices for protection against fire.

The inspection of all working places, shafts, and machinery at stated intervals.

The method of carrying on the inspection work is indicated in the description of the various types of organizations. Nearly all of the protective methods and devices are suggested through information gained on the inspection trips.

**Welfare and Educational Work.**—It has long been recognized that various measures looking to the welfare of workmen are most desirable from many standpoints. In the study of safety work it has developed that any line of work that will serve to secure the co-operation and confidence of employees is of the greatest value in promoting safety. Without the co-operation of the workmen safety work cannot advance, and in order to gain this co-operation it is necessary first to secure the confidence of the men. Indeed, many students of safety believe that the winning of this confidence and co-operation constitutes almost the entire safety problem. Lake Superior mining companies are spending as much, if not more, money in welfare and educational work than on the actual installation of safety devices.

Among the activities of several of the large companies looking to the welfare of the miner may be mentioned the following:

The provision of a pension fund for workmen who have grown old in the service of the company; erection of club houses where the workmen may spend their idle hours; the building of model towns and houses for the use of workmen; the offering of cash prizes for the best-kept premises, lawns, and flower gardens; the building of expensive and commodious dry or change houses. Practically every iron mine in the Lake Super-



ior region is provided with a dry or change house; some of these are models of cleanliness and perfection in other details.

Among the more important educational features designed to secure the co-operation of the miner, may be mentioned the following:

**Rules and Regulations.**—Practically all of the large companies issue to their workmen books of rules and regulations. In some cases these books are printed in from eight to ten different languages. In general, they cover all departments of mine work. These rule books in the past have contained many regulations that were not enforced, but of recent years there has been a noticeable tightening in this respect and the tendency now is to eliminate many of the useless rules and to be more strict in the enforcement of those retained. There is still room for improvement, however, in the matter of enforcing rules.

**Cash Bonuses.**—The matter of cash bonuses to bosses and others for the prevention of accidents has not, in the past, been given serious consideration. During the last year, however, the managements of several companies have come to the belief that an equitable system of cash bonuses will be of value in reducing accidents. There is only one company that has really put the system into operation. While the method used by this company cannot be termed strictly a bonus system, it is in principle the same thing. By paying to shift bosses salaries that were larger than those paid by other operators, but insisting that these shift bosses be safety enthusiasts, this company has conducted its operations with a minimum percentage of accidents for the district. One large company is preparing to adopt a system of paying large cash prizes to the shift bosses turning in the best records as to the number of men killed or injured while working under their supervision.

**Publicity of Accident Records.**—A method of attracting the attention of the workmen to the hazards of their employment, which has been adopted to a certain extent, is to post placards at various points in and about the mine calling attention to all serious accidents that happen, and pointing out how they might have been prevented. In some cases sketches and photographs are used as illustrations with these placards. At some mines the records of the different shift bosses, as to the number of accidents that happen to the men working under them, are posted in conspicuous places.

**Pay for Safety Suggestions.**—It is the general practice in the district to offer cash rewards for suggestions from workmen that may lead to safer working conditions.

**First Aid and Rescue Instruction.**—Through the activities of the mining companies, in co-operation with the Bureau of Mines, miners have been trained in first-aid and rescue work at practically every mine in the district. This work has not been limited to three or four men at a mine, but in many cases has been continued so that in some cases as many as 20 per cent. of the employees have received first-aid training. Training in rescue work, however, has usually been limited to from five to ten men at a mine, or group of small mines.

#### **Work of the County Mine Inspectors.**

The various counties of the Lake Superior district in which mines are situated, are each provided with a mine inspector. In some cases this inspector is allowed to employ such assistants as may be necessary in

his work. The various counties require that every mine shall be inspected at stated periods. The principal duty of the county mine inspector is to see that the mines are operated in accordance with the laws of the State. He is empowered with authority to cause the closing down of a mine in case the management refuses to comply with his demands. In reality, these inspectors have rendered services in excess of what is demanded of them by law. Through the study of conditions in the mines they gain information that is of common value; such information is disseminated to mine operators in the form of suggestions for the promotion of safety. One inspector has gone so far as to make and keep records of safety devices and methods. These he has communicated to all the operators in his county through the medium of circular letters and blue-prints. The efforts of these county mine inspectors and their assistants have gone far toward promoting safety in the mines of the Lake Superior region.

#### **Work of the Co-operative Range Committees.**

There have been organized on the various iron ranges what may be termed co-operative range committees. During the year 1913, five such organizations were perfected. It is believed, however, that only three of them are now holding regular meetings and doing efficient work. These committees are made up of mine superintendents, mine captains, shift bosses, safety inspectors, men in charge of first-aid and rescue work and other mine employees interested in safety work. The committees have the backing of the management of the mines, which stand the bulk of the expense of carrying on their work. The organizations are made up of representatives of practically all companies within a given radius. For instance, the Gogebic Range Mining Association includes in its membership representatives from all companies operating on the Gogebic range. The purposes of this organization, as set forth in its by-laws, are to promote social intercourse and the interchange of ideas on all subjects of mining interest, for the mutual benefit of its members; and to perpetuate efficiency, welfare, safety, mine-rescue work and first aid to the injured in and about the mines. These purposes are accomplished by (a) social meetings; (b) remarks, discussions, and the presentation of papers by members of the organization at different times; (c) occasional visits to the different mines, plants and properties upon invitation of the management of same; and (d) occasional competitive meets for crews trained in mine-rescue work and first aid to the injured.

The greatest good done by these committees has been in disseminating, for the benefit of all the mining companies, information relating to safety, efficiency and other mine work. They have developed in some cases into organizations representing the needs and wishes of entire communities. Their opportunity for the promotion of the general welfare is unlimited.

#### **Work of the Lake Superior Mining Institute.**

The Lake Superior Mining Institute some years ago established a committee on practices for the prevention of accidents. This committee holds special and stated meetings at which are considered important problems relating to safety and mine operation. Among important subjects upon which recommendations have been made may be mentioned the uniformity of mine-accident reports. Under present conditions the mining companies make reports of accidents to several different organizations, all of which require different classifications of accidents. The work thus entailed



ed is enormous. By providing a uniform type of report this undue work may be eliminated. Furthermore, reports of the county mine inspectors, although satisfactory as far as the needs of each county are concerned, are made in such form that it is impossible to make intelligent comparisons of records of the various counties. An effort will be made, through this committee, to standardize all reports.

In addition to other important considerations, a study is now being made of mine rules and regulations, with a view to eliminating unnecessary regulations and including others that appear to be of paramount importance.

This committee recently considered and made recommendations that led to the holding of a first-aid contest at Ishpeming, Mich., during August, 1914. This meet was attended by teams from all over the Lake Superior region.

### Work of the Federal Bureau of Mines.

The Federal Bureau of Mines has headquarters at Ironwood, Mich., established in November, 1912. It has recently acquired, through lease, a small tract of ground on the right of way of the Chicago & Northwestern Railway, and a spur has been built thereon for the accommodation of the rescue car. Arrangements have been practically perfected under which the operators of the Gogebie range will erect a building containing the necessary office room and housing for the rescue car.

The Bureau's representatives in the district have comprised a district engineer, a foreman miner, and a first-aid miner. The rescue car has been active in training the miners of the entire region in first aid to the injured and rescue work. It has not, however, been continuously engaged in this work owing to lack of available funds. Up to the present time there have been trained in the entire district a total of approximately 700 men in first aid to the injured, and 400 men in the use of oxygen breathing apparatus. These men have trained others and it is estimated that there is now a total of 2,000 men in the district who have received training in first aid to the injured, and 1,000 men who have received training in the use of oxygen breathing apparatus.

In addition to this work of training, the district engineer has visited and examined a large proportion of the mines of the region. These examinations were followed in some cases, at the request of the management, by recommendations for increasing safety in the mines. Special investigations undertaken include those having to do with ventilation, mine fires, organization and conduct of safety work, the use of mine sign boards, and hoisting signals. Papers have been written on these subjects for publication by the Bureau and by various mining institutes. Other educational work carried on

comprised illustrated lectures to the miners in and about the mines visited by the rescue car. The district engineer brought about the organization of the co-operative range committees mentioned on preceding pages.

The activities of the Bureau of Mines have doubtless been instrumental in furthering the work of safety. Its chief function has been in stimulating activity in safety, rescue and first aid work. The moral effect of the presence of the car and its attendants has served to call the attention of the miner to the fact that the subject of safety and first aid is of sufficient interest and importance to cause the government to take an active hand in the work. The Bureau of Mines' representatives have worked in co-operation with the operators and everyone else engaged in safety work in the region, and have been favored with most courteous treatment and co-operation in all their efforts. It might be added here that the writer has, for the past two years, served as district engineer of the Bureau in the Lake Superior region.

### Results of the Safety Movement.

It is not possible at this time to prepare a statement that will indicate the full measure of benefit derived from the practice of safety work in the Lake Superior region. The safety movement is practically in its infancy, and a period of years must elapse before any fair estimate can be made of the actual good resulting from it. All classes of accidents are steadily decreasing. The next few years should show a proportionate or even greater decrease.

Inquiries as to the reduction of accidents through safety work directed to all the operators of the district were answered, in a majority of cases, by the statement that records are not yet available; there were many indefinite replies stating that accidents had decreased; no replies were received stating that accidents had increased. Personal inquiry by the writer brought forth statements from the most important operators indicating that safety work has caused a material reduction in accidents, and that they are all desirous of continuing the work. In many instances a great deal of enthusiasm was displayed.

No accurate records exist of accidents in the Lake Superior mines for a period of years. The Bureau of Mines only began the collection of accident statistics in metal mines in 1911. However, a compilation showing the fatal accidents for ten years previous to 1911 has been made by O. C. Davidson, General Superintendent, Oliver Iron Mining Co., Iron Mountain, Mich. Mr. Davidson reviewed the county mine inspectors' reports from Sept. 30, 1901, to Sept. 30, 1911. With the data thus obtained, and tonnages based on statements of shipments published by the Iron Trade Review, he was able to prepare this interesting statement. The compilation is submitted herewith.

### Summary of Fatal Accidents in Michigan Iron Mines From Sept. 30, 1901, to Sept. 30, 1911.

County	Tons Ore Mined 10 Years	Employees 10 years	Fatal Accidents Reported	Tons Produced per Fatal Accident	Fatal Accidents per 1,000 men
Dickinson. . . . .	22,601,474	31,836	84	269,065	2.638
Marquette. . . . .	36,721,389	57,161	248	148,070	4.339
Gogebie. . . . .	29,191,952	42,471	226	129,168	5.321
Iron. . . . .	17,986,380	20,962	158	113,838	7.537
	106,501,195	152,430	716	148,745	4.697

The number of fatal accidents and other data for the years 1911 and 1912 are shown below. It may be noted from this table that Minnesota stands first and Michigan second in the column showing the number of men killed per thousand employed. The other States included in this table comprise the chief metal-mining States of the country.

**Fatal Accidents in Various Metal-Mining States During the Calendar Years 1911 and 1912.**

State.	Operators Reporting		Employees		Killed		Killed per 1,000 Employed	
	1911	1912	1911	1912	1911	1912	1911	1912
Alabama.....	25	20	4,101	4,827	10	33	2.44	6.84
Arizona.....	352	479	12,768	15,591	70	67	5.48	4.30
California.....	855	1,048	10,877	10,312	38	40	3.49	3.88
Colorado.....	660	624	10,404	8,892	43	48	4.13	5.40
Idaho.....	513	639	4,801	6,229	23	29	4.79	4.66
(a) Michigan.....	74	79	31,584	29,469	134	96	4.24	3.26
(b) Minnesota.....	40	43	16,548	16,559	76	50	4.59	3.02
(c) Wisconsin.....	8	11	1,157	2,338	2	9	1.73	3.85
Montana.....	332	405	13,346	13,340	62	50	4.65	3.75
Nevada.....	472	554	6,210	7,547	50	34	8.05	4.51
Utah.....	295	336	7,710	8,458	49	41	6.36	4.85

a In copper mines, 14,893 men employed, 44 killed, 2.95 killed per 1,000 employed. In iron mines, 14,378 men employed, 52 killed 3.62 killed per 1,000 employed. bAll iron mines. cAll iron mines.

In summing up the beneficial results of the safety movement, it may be said that by far the most valuable accomplishment has been the reduction in the number of deaths, and serious and permanent injuries. This, of course, has been brought about through the improved working conditions in the mines, more vigorous inspection, and the reduction of the hazards to the worker through the use of various safety devices. Bodily suffering has been reduced, the earning power and efficiency of the worker has been increased, and mental suffering and hardship on the part of widows, orphans and other dependents has been lessened.

Not only have beneficial results been forthcoming from a humanitarian standpoint, but also from a financial standpoint. When a miner is injured the money that he can contribute toward the support of his dependents is curtailed in proportion to the seriousness of his injury. If the miner is killed the support of his dependents devolves upon others, thus giving them a double burden to bear. The employer also sustains financial loss, both in hospital expenses and in the payment of compensation. On the Marquette range, when a miner is killed, it has long been a custom for the entire mine force to cease work until the victim of the accident has been buried. The loss caused in this way amounts to approximately \$2.30 per day per man involved, and an average of \$500 in fixed charges to the company for every fatal accident.

Another source of financial loss is that sustained by the tax payers for the maintenance of courts for the trial of damage suits. Investigation discloses that in one Minnesota county \$75,000 per annum has been spent in this manner.

In addition to the reduction in the loss of life, and the saving in money to both the miner and the operator, other benefits have developed. There appears to be a better understanding between employer and employee and the miners are beginning to realize that the safety work is being done for their benefit. Throughout the district a strong spirit of co-operation is noticeable, not only between the miner and employer, but between the officials of the various mining companies and mining districts. Information regarding safety and efficiency work is exchanged between operators with the

utmost freedom, and there is hardly a mine in the region that is not open for inspection as far as safety devices and methods are concerned.

### Does Safety Work Pay?

Answering the question as to whether or not safety work pays, one may say without hesitation that it pays

enormously from a humanitarian standpoint. There is no argument here. The records of many coal companies and other organizations which have practised safety work for a number of years show undoubtedly that it pays also from a financial standpoint. As to figures on this phase of the question in the Lake Superior district, nothing accurate is possible of compilation. Without the cost of the work as a basis, acceptable figures cannot be submitted.

However, there is a method of arriving at approximate figures, based upon actual conditions in the Lake Superior region. Before going into this, it seems proper to submit some figures regarding the compensation that must be paid to miners for various classes of injuries. The States of Michigan, Minnesota, and Wisconsin all have in force a workman's compensation act. The following information is from the Public Acts of the State of Michigan, the provisions of which differ little from those of Wisconsin and Minnesota.

In case of a fatal injury to an employee, the employer must pay to the dependents of the injured a weekly sum equal to one-half his average weekly wages, but not more than \$10 or less than \$4 a week, for a period of 300 weeks from the date of the injury.

In case of permanent disability resulting from injury, the employer shall pay to the injured a weekly compensation equal to one-half his average weekly wages, but not more than \$10 or less than \$4; in no case shall the period covered by such compensation be greater than 500 weeks, nor shall the total amount of such compensation exceed \$4,000.

Thus it may be seen that a permanent injury may cost the company more than a fatal injury. For injuries resulting in temporary disability, the injured receives a weekly compensation equal to one-half the difference between his average weekly wages before the injury and the average weekly wages which he is able to earn thereafter, but not more than \$10 a week; and in no case shall the period covered by such compensation be greater than 300 weeks from the date of injury.

The above provisions are followed by a long list of payments to be made to the injured in case of the loss of a finger, a hand, a foot, an eye, etc.

In order to show what saving may be effected through the practice of safety work, let us assume an



iron mine employing 1,000 men per day, in which no money is spent for safety work. Past experience has pointed out that a mine of this size, making no attempt to prevent accidents, may easily make the following yearly accident record:

Number of men killed, 6; number of men seriously injured, 40; number of men slightly injured, 250.

A serious injury may be considered as one that incapacitates the workman for more than 20 days; a slight injury one that incapacitates him for less than 20 days. The total cost in compensation for this sum of accidents, based upon the compensation stated above, may be as follows:

Six men killed, at \$2,500 each, \$15,000; two men permanently injured, at \$3,000 each, \$6,000; 13 men, average disability 20 weeks, at \$7 per week, \$1,820; 25 men, average disability 8 weeks, at \$7 per week, \$1,400; 250 men slightly injured, average disability 1 week, at \$7 per week, \$1,750; legal fees, hospital and other casualty expenses, \$15,000; total \$40,970.

This tabulation does not include payments for the loss of hands, feet, etc. In total amount it is below many records that have been noted by the writer.

Now, let us suppose that this company had practised safety work, and that the death rate was three men killed per 1,000 employed (approximately the Minnesota 1912 rate) and the injuries proportionately lower. This would mean a reduction of one-half, or a saving of approximately \$20,000.

Of course the safety work will cost something, but even if it amounted to \$10 per year per man employed, or \$10,000 in this case, there would still be a balance of \$10,000 saved.

#### Conclusions.

It has not been the intention in this paper to convey the idea that the Lake Superior iron ranges comprise the only metal-mining region in the United States where efficient safety work is done. It is acknowledged that there are individual mines elsewhere that can show accident records just as good, and possibly better than those of some of the Lake Superior mines; also that the safety movement is gaining ground throughout the various metal-mining districts of the United States. The operating companies of the Lake Superior region are for the most part large and strong financially and they can well afford to lead the way in work of this nature. In the Western metal-mining States there is a much larger proportion of small operations and prospects, the owners or lessees of which cannot afford to go to great lengths in the matter of safety.

It is hoped that all mine operators, from the insignificant prospector to the wealthy magnate, will eventually recognize the value of safety work. Sufficient records are now available, both from coal and metal-mining districts, to prove that safety work pays from every standpoint. In this connection, it is well to be able to say that safety work pays from a financial as well as a humanitarian standpoint, for it is a sad but true commentary that there are still some operators who cannot be appealed to except by a promise of financial gain.

The writer feels that he has not done justice to the subject matter of this paper, especially that part of it dealing with the vast good that has been accomplished through the lessening of death and suffering. Again, some data concerning other phases of the subject have of necessity been omitted owing to the short time that was available in which to prepare this paper.

## THE COLLIERS' MARCH

By F. W. Gray.

They come, with muscled chests and calloused hands,  
Their limbs enured to toil by pick and spade;  
They come to swell the far-drawn gathering bands  
Pressing to Britain's aid.

They whose stark backs shone ebon in the gleam  
Cast by the safety lamps' uncertain light.  
Their eyes illumined by the patriot's dream,  
Now gird them for the fight.

For they have read how, when the German tramp  
Was heard on Belgian ground, the ruthless Hun  
Forced the swart miner, carrying safety lamp,  
By bayoneted gun,

To walk before the coward host, and shield  
Their craven hides against the flaming ire  
Of freemen, who disdained their hearths to yield.  
And answered fire by fire.

The men who drave the wedge 'twixt coal and thill,  
And swung the pick prone on the damp mine-floor,  
Shall prove in swimming trench their strength and skill,  
When guns are to the fore.

Who daily bores the hole and rams the shot  
And hears the shattering crack reverberate  
Through room and headway, he will falter not,  
To dare the Teuton hate.

The weary march with gun and heavy pack,  
The dank and clammy trench, the long day's end,  
Will find the collier's toil-accustomed back  
Erect and last to bend.

He who through flame and smoke has burst,  
To snatch from fiery death a comrade true,  
Will he not dare the mitrailleuse's worst,  
And "see this business through"?

They come, from far and near, from East and West,  
From York and Lancaster, the "Koylics"\* come;  
Cape Breton's Highlanders, Alberta's, best:  
Follow the sounding drum.

From hills of gallant Wales, Australia,  
New Zealand and Natal, Lanark and Fife;  
From Crow's Nest Pass, and from far India,  
They hear the thrilling fife.

The German hosts his tested arm shall know,  
Shall dread the collier's bayonet and shall rue  
In blood and anguished tears, the coward blow  
At Belgium, leal and true.

\*Note.—The nickname "Koylics" is a play on the initials of the King's Own Yorkshire Light Infantry, and on the fact that the word "coal" is in the Yorkshire dialect pronounced "koi." The K. O. Y. L. I. is composed largely of coal miners. It will be remembered they suffered very severely at Mons. Their regimental flag bears the name of "Minden" where the regiment fought gloriously in the 18th century. Minden is about halfway between Aix-la-Chapelle and Berlin, a good augury.

## MINING IRON ORE\*

By E. S. Dickinson.

Not long after my graduating from the Michigan College of Mines, I was sent to examine and report upon a mine in which my company was interested but which it was not operating. I was requested to report on whether the mine was in shape to produce the amount of ore promised to be delivered that season, and if not, what in my judgment must be done to put the mine in shape to produce the ore. Among the questions asked were the following: How many men are needed to produce the ore? Are there proper accommodations for the men? How many men can be worked to advantage in the mine? Are more working places needed? Are more chutes needed to handle the ore? How many drills are on hand and how many are needed? Are there tram cars enough?

The various questions in regard to hoisting and surface equipment were not so difficult to handle, but for some of the above I found that I had little actual data to guide me. For some of them I even had to depend upon the guess of some practical miner or mining captain.

Within the last few years a lot of data have been published which a few years ago were next to impossible to get. The following data were not taken under

test conditions and do not indicate the best that we could do under special effort. They are taken at random from my notes covering the development and mining of entire blocks of ore, also the mining or stoping of the ore without taking into consideration the development work necessary.

In this work the machine operator had to pick down all loose dirt and make the place safe to work in, set up his machine and drill his holes, get his explosives from the powder house, charge and blast. No effort was made to drill as many feet as possible, the test of efficiency being the amount of ore broken by the machine and the condition the working place was left in. I believe with efficiency methods and expert supervision these results could be increased from 25 to 50 per cent. I find that a great deal depends on the chute men. The miners make it a point of honor to keep the chutes full of ore, and when they are nearly empty will work well to break more ore, while if there is plenty of ore in the chutes they are liable to take it easy.

In the following tables the items represent amounts of work—stopping, drifting, etc.—accomplished in one month.

### Underhand Stopping Into Chutes.

The data include development work and trimming the back, but not the building of chutes and tracks. The ore was in a solid chunk, the east end of it, however, being in solid rock on the level, so that drifts and chutes had to be put through the rock to get to it. Raises were put up and chutes built, a sub-level run at the top of the ore and the ore broken into the chutes by underhand stoping. The trammers trimmed the back. Ore trammed to shaft, an average distance of about 250 ft., and dumped into skips. Ore, medium hard, standing well.

1. Number of drill holes.
2. Total feet drilled.
3. Sticks of dynamite below 40 per cent.
4. Sticks of 40 per cent. dynamite.
5. Sticks of dynamite above 40 per cent.
6. Feet of fuse.

7. Number of exploders.
8. Hours work of miners and helpers.
9. Number cars ore (1½ tons each).
10. Number cars of rock.
11. Hours work of trammers.
12. Advance in feet of drifts, cross-cuts or raises.

	1	2	3	4	5	6	7	8	9	10	11	12
Crosscut. . . . .	168	632	127	634	20	1225	173	320	131	...	140	47
Drift. . . . .	56	220	...	255	22	402	58	100	60	...	55	22
Crosscut. . . . .	?	?	20	1466	81	2079	297	600	320	100	305	123
Drift. . . . .	?	?	186	953	77	2212	319	780	298	...	373	138
Raise. . . . .	?	?	85	499	49	1033	148	320	129	...	128	60
Drift. . . . .	?	?	71	137	..	455	65	140	71	58	62	30
Crosscut. . . . .	?	?	9	289	42	693	99	250	121	...	135	87
Drift. . . . .	221	971	...	424	314	2294	242	440	198	...	220	71
Raise. . . . .	162	695	...	232	281	1292	184	380	103	...	118	54
Raise. . . . .	?	?	32	327	116	904	128	300	128	...	134	?
Sub-level. . . . .	?	?	...	125	6	246	38	80	*	...	28	?
Stope. . . . .	?	?	222	582	...	969	139	770	787	...	374	...
Stope. . . . .	?	?	81	831	42	1107	167	670	1891	...	445	...
Stope. . . . .	?	?	165	2664	221	3287	492	2367	3158	70	1536	...
Stope. . . . .	393	3433	497	1968	265	2900	442	2270	4096	...	2255	...
Stope. . . . .	497	3976	28	2707	85	3432	518	2525	4044	...	2455	...
Stope. . . . .	229	1973	130	1541	...	1618	250	1895	2408	...	1901	...
	1778	11900	1663	15654	1498	26150	3759	19007	26917	138	10669	632

\*Dumped in chutes. Pounds of dynamite per ton broken, 0.336. Tons per machine shift, 42. Tons per foot of development, 64. Tons per hour of trammers' labor, 3.8.



**Blasting Down Floor Pillar 30 Ft. Thick.**

One end pitching down to lower level. Ore runs down to a plank sollar from which it is shoveled into 1½ ton tram cars, trammed to shaft and dumped into skips. Trammers at times have to pull dirt and assist it to run to lower level. A little development work is done to enable the men to work in the pillar under cover of ore which is taken down as the work progresses. A large open stope overhead.

1. Number of drill holes.
2. Feet drilled.
3. Sticks of 40 per cent. dynamite.
4. Sticks of 27 per cent. dynamite.
5. Feet of fuse.
6. Number of exploders.
7. Hours labor of miners and helpers.
8. Cars of ore.
9. Hours labor of trammers.
10. Advance in feet.
11. Tons per machine shift.

	1	2	3	4	5	6	7	8	9	10	11
Winze. . . . .	147	614	642	55	1183	158	480	...	117	38	...
Winze. . . . .	25	206	642	...	240	45	200	78	85	...	13.8
Winze. . . . .	...	356	348	55	673	84	300	...	55	20	...
Crosscut. . . . .	...	...	1430	183	887	129	860	...	...	...	...
Crosscut. . . . .	...	...	22	25	234	86	...	634	365	...	26.0
Crosscut. . . . .	...	...	22	6	109	24	...	397	214	...	27.7
Crosscut. . . . .	39	352	309	...	438	97	220	620	380	...	24.0
Crosscut. . . . .	169	1394	1107	173	1579	283	980	1595	850	...	28.1
			4190	324	3020		3020	3324	2067	58	

Tons per machine shift, 53.5. Tons per hour of trammers' labor, 2.41. Pounds of dynamite per ton broken, 0.475.

**Developing and Mining Small Body of Ore, Underhand Stopping.**

Loading from chutes into 1½-ton cars and tramping approximately 150 ft. to an electric locomotive. No. 3B Rand drills used. Data do not include the building of tracks and chutes. Ore medium hard, standing well, red hematite with yellow ocher seams.

1. Number of drill holes.
2. Feet drilled.
3. Sticks of 80 and 60 per cent. dynamite.
4. Sticks of 40 per cent. dynamite.
5. Sticks of 35 and 27 per cent. dynamite.
6. Feet of fuse.
7. Number of exploders.
8. Hours labor of miners and helpers.
9. Cars of ore.
10. Hours labor of trammers and dirt-pullers.
11. Advance in feet.
12. Tons per machine shift.
13. Tons per shift trammers.

	1	2	3	4	5	6	7	8	9	10	11	12	13
Raise. . . . .	?	?	110	...	130	448	64	200	74	90	40	11.1	12.3
Drift. . . . .	55	253	136	36	27	315	45	140	78	107	29	15.3	11.0
Winze. . . . .	23	94	...	115	...	161	23	120	26	33	15	6.5	11.0
Winze. . . . .	?	?	6	568	242	973	139	510	108	177	73	6.0	8.6
Drift, raise .	195	923	...	179	477	1336	192	480	132	167	90	8.3	11.9
Raise. . . . .	16	80	...	26	27	112	16	40	8	31	...	9.5	6.0
Drift. . . . .	?	?	...	12	306	630	90	200	94	120	51	14.1	11.8
Stope. . . . .	?	?	16	487	323	930	143	560	376	114	...	20.2	49.4
Stope. . . . .	?	?	51	456	132	621	103	460	1019	431	...	66.5	35.4
Stope. . . . .	345	3004	153	1408	824	2468	278	1640	3671	1439	...	67.1	38.2
Stope. . . . .	?	?	87	1211	664	2756	410	1743	2931	1289	...	45.4	34.2
Stope. . . . .	238	1831	208	1127	342	1716	277	1020	2464	1122	...	72.4	32.9
Stope. . . . .	175	1393	...	1232	...	1578	349	680	2432	1326	...	107.5	27.6
			767	6929	3496			7993	13419	6446	298		31.2

Pounds of dynamite per ton broken, 0.458. Tons per machine shift, 50.3. Tons per hour of trammers' labor, 3.12. Tons per foot development, 67.5.

**Underhand Stopping a Block of Iron Ore.**

This block of ore has been developed by drifts and crosscuts on the bottom level, and by a large open stope on the top; therefore to prepare for mining, it was necessary only to put up required raises and some short drifts. The ore is loaded from chutes and trammed about 200 ft. to shaft. The trammers must pull the dirt to the chutes when it refuses to run by gravity.

1. Sticks of 60 per cent. dynamite.
2. Sticks of 40 per cent. dynamite.
3. Sticks of 27 per cent. dynamite.
4. Sticks of 35 per cent. dynamite.
5. Feet of fuse.
6. Number of exploders.
7. Hours labor of machine runners and helpers.
8. Cars of ore, 1½ tons.
9. Hours labor of trammers.
10. Tons per machine shift.
11. Tons per man, shift trammers.





## PERSONAL AND GENERAL

Mr. Robert Flaherty, of Toronto, and Miss Frances Hubbard, of Houghton, were married in New York last week.

Mr. R. R. Wiggins is in Nicaragua for the Riter-Connelly interests.

Mr. R. R. Van Valkenburg is in the employ of the Alaska Gastineau Mining Co., at Juneau Alaska.

Dr. James Douglas has resigned from the Green Consolidated Copper Co. and affiliated concerns, both as general manager and vice-president.

Mr. Albert Mendelssohn has been appointed superintendent of the Baltic mine, Michigan, to succeed Mr. W. R. Bolley.

Mr. W. A. Cameron, superintendent of the Consolidated Mining and Smelting Company's mines in Slocan district of British Columbia, has returned to New Denver, B.C., after having spent several weeks on a vacation in Eastern Canada.

Mr. Lorne A. Campbell, of Rossland, B.C., manager of the West Kootenay Power and Light Co. and allied companies, has been in the East on a business visit.

Mr. E. J. Conway, of Vancouver, B.C., was married on November 7 to Miss Mary Linnie, daughter of Captain and Mrs. Conway, also of Vancouver. Mr. Conway graduated B.Sc. from McGill in 1909, and the same year went to the Whitewater mines, Slocan district of British Columbia as assayer. Afterward he was with the Tye Copper Co., Vancouver Island, for some time, and since that company suspended operations he has been on the engineering staff of the Granby Consolidated Co. at one or other of that company's properties on the coast.

Mr. Howard W. Dubois, of Philadelphia, who has been much in British Columbia in recent years, went to Alaska a short time ago on a professional trip.

Mr. Thomas Graham, chief inspector of mines for British Columbia, who has taken much interest in having miners instructed in mine rescue work and first aid to the injured, has been elected a member of the executive of the British Columbia Council of the Canadian Branch of the St. John Ambulance Association.

Capt. Harry Johns, who, until the suspension of mining operations in that part several months ago by the British Columbia Copper Co., was in charge of the several mines the company had for some time been developing in Nelson and Slocan mining divisions, returned to Nelson, B.C., lately, from a trip to Portland, Oregon.

Mr. I. M. Merrill, of Los Angeles, Cal., president of the Hedley Gold Mining Co., was a visitor last month to the company's property in the Similkameen district of British Columbia.

Mr. G. F. Perks has returned to Vancouver after having spent about three months in the Omineca placer gold field where, on gold-bearing streams, he located ground for dredging purposes.

Mr. Elias Rogers, of Toronto, president of the Crow's Nest Pass Coal Co., has been in British Columbia on one of his periodical visits to the company's collieries in Southeast Kootenay. From the Crowsnest district he went to Victoria, where he spent a few days before returning East.

Mr. L. B. Reynolds, of Nelson, B.C., who went to England with several other mining engineers from Kootenay district as a part of the Canadian contingent for active service in the European war, supplied the Nelson Daily News with an interesting account of the ocean trip between Quebec and England.

Mr. E. H. Sampson, who, prior to the stoppage of mining at the Bluebell mine, Kootenay lake, B.C., owing to the closing of the market for lead, was assayer at that mine, is now filling a similar position at the Jewel gold mine, in Boundary district.

Mr. Stuart J. Schofield, of the Geological Survey of Canada, has finished his 1914 field work in West Kootenay district, British Columbia, and is expected to soon be back in Ottawa.

Mr. Yolen Williams, of Spokane, Washington, for some years superintendent of mines in British Columbia, first at Rossland and later in charge of the development of the Granby Consolidated Co.'s big copper mines at Phoenix, was in Tulameen district, B.C., last month.

M. Beatty & Sons, Welland, formerly represented in Toronto by H. W. Petrie, Ltd., have opened a district office in the Builders' Exchange, 154 Simcoe street, in charge of Mr. K. M. McKee.

Mr. Benjamin Strong, jr., has resigned as a director of the International Nickel Co.

Canadian General Electric Co., Ltd., has issued a bulletin on batteries for storage battery locomotives.

## OBITUARY

Our readers will regret to learn of the death on November 14 of the wife of Dr. D. D. Cairnes, of the Geological Survey.

**J. S. C. Fraser**, manager of the Victoria, B.C., branch of the Bank of Montreal, who died in Toronto on November 4 from ptomaine poisoning, while on a visit to his aged mother in this city, was long closely associated with the development and progress of the mining industry at Rossland, B.C., where he managed the local branch of the same bank for sixteen years. His untimely death at the comparatively early age of 52 is deeply regretted both in Kootenay district, where he came into business contact and enjoyed the friendship and goodwill of many mining men, and in the coast cities, where he was also well known. His body was taken back to British Columbia and interred at Victoria on November 17.

On November 13 the death occurred, at Victoria, B.C., of **Randall Hitchcock Kemp**, who was one of the pioneers of Ainsworth and Slocan districts of British Columbia, to which Province he went from the United States nearly a quarter of a century ago. The late Mr. Kemp was born at Wellsburg, West Virginia, in the early part of 1852, so was in his 63rd year. No particulars of his early connection with mining are available, but it is known that for some time he was assaying in the States. Afterwards he went to Ainsworth (then known as Hot Springs), on Kootenay lake, B.C., and in that camp and in Slocan, when in 1891 and 1892 many of the best known mining properties of that part of West Kootenay were discovered, he was well known among nearly all the pioneer miners and prospectors. For a time he lived at Kemp's Springs, a few miles from Kaslo. In September, 1896, the "British Columbia Mining Record," then finishing its first year of publication, included in its contents for that month an interesting history of the discovery of the Payne and other Slocan properties that afterward became widely known, which account was written by Mr. Kemp. In the late nineties or the earliest years of the present century Mr. Kemp was editor of a mining journal published in Spokane, Washington. After a few years in



that State, divided between mining engineering and journalism, he went to Alaska, where he spent some years in frontier life, still keeping up his connection with publicity work. Eventually he drifted back to West Kootenay, and for a while lived on a small ranch a few miles from Nelson. Then he went to Silverton, Slokan lake, and in that neighborhood was employed at the Standard silver-lead mine until, about the beginning of the present year, cancer of the tongue developed. For some weeks he was treated in the hospital at New Denver, and then last summer he went to Victoria to have the benefit of skilled treatment there. In September he was sanguine of recovery, for his condition seemed to have much improved but had a change for the worse until, before the middle of November, the end came of a life marked by many vicissitudes and adventures such as come to men who spend much of their lives on the outer rim of civilization. Mrs. Kemp, his faithful companion throughout his western life, was with him to the last, and witnessed his burial at Victoria on November 16.

On Sunday afternoon, November 15, **Hon. Wm. Templeman**, the first Minister of Mines of Canada, died at his home in Victoria, B. C., at the age of seventy years. Four months ago his wife died, which bereavement he felt keenly. Shortly afterward he underwent a serious surgical operation and from this he appeared to be slowly recovering, so that he contemplated taking a trip to California in December. Finding his strength returning, he was able during several weeks to give attention to business for a few hours of each day. On the evening of November 13 he was down town and chatted cheerfully with friends, though complaining a little that he was not feeling so well as he had been, but expected that a night's rest would give relief. However, early next morning he became seriously ill, and in the afternoon lost consciousness in which condition he remained until the afternoon, of Sunday, 15th, when he passed quietly away. Mr. Templeman was born of Scottish parents at Pankham, Lanark county, Ontario, on September 29, 1884. He was educated in the schools of his native town, and then served a four years' apprenticeship as a printer. Next he spent two years following his business in the United States, and then, in 1867, returned to his native county and, in company with another, founded the *Almonte Gazette*. He retained the management and control of that publication until early in 1884, when, the paper having meanwhile become a valuable property, he sold out and went travelling for several months. In the autumn of 1884 he arrived in Victoria, British Columbia, and soon took charge of the *Victoria Daily Times*, then but six months old. Eventually he acquired that newspaper, and through the years that have since passed gradually built up for it a large circulation and also made it the leading Liberal newspaper in the province. In November, 1897, Mr. Templeman was summoned to the Senate of Canada, having previously been an unsuccessful candidate for election to the House of Commons. In February, 1902, he became a member of the Laurier administration, but without portfolio until February, 1906 when he was appointed Minister of Inland Revenue. Upon the removal of the Geological Survey and Mines affairs from the Department of the Interior and the creation of the Canada Department of Mines, Mr. Templeman was, on May 3, 1907, appointed Minister of Mines, the first occupant

of that office in the Dominion, which portfolio he held until after the defeat of the Laurier Government in the autumn of 1911. He was active in securing the Government Bounty on lead mined and smelted in Canada, which has since been of so much assistance to lead mining in British Columbia. The work of the Geological Survey was greatly enlarged following Mr. Templeman's becoming Minister of Mines, and, too, that of the Mines Branch. The great assistance he was to the mining industry of the Dominion is not much known, save perhaps to the officials prominently associated with it. He also did good service in other departments of the work connected with his dual offices, but it is in connection with the Mines Department that his efforts were especially beneficial to the Dominion.

## BOOK REVIEW

**ELECTRICITY IN COAL MINING**—By David R. Shearer—McGraw Hill Book Co., New York, 1914—Price \$1.50—For Sale by Book Department, The Canadian Mining Journal.

This little book of 75 pages has been published to fill a demand for a small treatise covering many phases of electrical engineering as applied to coal mining. Methods of procedure are outlined, and information is given concerning the foundations upon which an electrical power plant may be established and operated efficiently.

The contents of the book are indicated by the following Chapter headings: Introduction; Direct-Current Calculations; Alternating-Current Calculations; Bell and Signal Systems; Selection of Power Plant Equipment; Direct-Current Power Plant Design; Alternating-Current Power Plant Design; Prime Movers and Generators; Motors and Haulage Equipment; Coal Cutting Machinery; Electricity for Operating Fans and Pumps; The Repair Shop; Fundamentals of Efficient Operation; Appendix; Tables.

An oft repeated rumor that Russians were being transported through England to France has been variously accounted for. Perhaps an explanation of the beginning of these Russian stories has now been received. England imports normally large quantities of Siberian produce by way of the Baltic, including eggs, which are known in the trade as "Russians." When the Baltic was closed by the war, English importers arranged to have these shipments continue via Archangel, and in confirmation of these plans, the following telegram was received:

"65,000 Russians will arrive at Aberdeen as arranged."

Somebody less familiar with trade than with war stories saw this telegram. Rumor spread it and the whole British Admiralty with a press bureau and official denial is powerless to stop it.

Germany is said to be experiencing a scarcity of petroleum, due in part to loss of supplies from Russia and Austro-Galician oil fields, but mainly to breakdown of arrangements for imports from the other side of the Atlantic.

The boiler house and compressor plant at the Superior Mine, Houghton, Mich., has been destroyed by fire.



## SPECIAL CORRESPONDENCE

## COBALT, GOWGANDA, SOUTH LORRAINE

**Crown Reserve** directors have decided to cut the dividend, probably to one per cent. a month. The pumping of the lake has now ceased and it will not be possible for the Crown Reserve to obtain any further high grade as the result of prospecting until next spring. The low grade from the dump and from development which is being treated at the Dominion Reduction is paying the running expenses of the mine. The stock of the Porcupine Crown, held by the Crown Reserve, will, on its present basis, return to shareholders about 8 per cent. a year. The high grade ore in the Crown Reserve has almost been exhausted, and until results can be obtained from the draining of the lake it is not possible to return the large premiums that Crown Reserve has been paying to its shareholders.

There is a good deal of excellent conglomerate yet to be prospected under the lake, but as it is shallow this cannot be done until the bottom of the lake is quite pumped out, not only of water, but of mud, and this was impossible this year.

The best discovery ever made on the Silver Leaf has been made recently at the 75-ft. level. It was opened up in running a crosscut parallel to the Lawson line, some 600 ft. from the Crown Reserve line. It is an inch wide, of very high grade ore. The Crown Reserve is now entering upon its second period of five years as the lessees of the Silver Leaf, and this is the first discovery they have ever made of any importance. A large vein of cobalt ore was opened up at the 500-ft. level; but it was too low grade to mine at a profit. The Crown Reserve had the right to extend the option of the lease for a period of another five years and decided to do so. A new agreement has now been drawn up relative to conditions between the two companies.

The price of Silver still continues far too low to be of good augury to the silver mining companies. There was a slight rise after the news of the sinking of the Emden became known; but the relief was not permanent. It would not be wisdom to deny that although the situation is not so acute as after the outbreak of the war that it is still critical. Particularly is this so in regard to the low grade properties which are working on a narrow margin of profit per ton. Many of the companies with large surpluses are holding their silver bullion until such time as silver goes up, the belief being almost universal that it will go up and will maintain a high level when it does start to mount.

**Seneca Superior** adhered to the old dividend shorn of its bonus for the December disbursement. This amounts to 10 per cent., or \$47,638. The company has been paying dividends every two months instead of every quarter, and in the short existence has paid back to the original shareholders at par 135 per cent., or \$643,218.

**Cobalt Lake.**—The preliminary work necessary to lowering Cobalt Lake by six and a half ft. is progressing, and the water should be down to the required level by the first of December. The rock is being excavated from the cut at the foot of the lake in order that the shore may be exposed some six ft. and the town trunk sewer laid along it. This work is being done for the town by the Cobalt Lake Company, the town being quite unable to raise the necessary money

at this juncture. Every preparation for the pumping of the lake early next spring has been made. The dams at Short and Pickerel lakes have been completed and the scows upon which the pumps will be placed are now moored on the lake. The scow will be placed directly opposite Cobalt station and the water will be pumped direct to the open cut at the foot of the lake whence it will flow into Mill Creek.

**Shipments of ore** from Cobalt proper last month only showed a slight diminution as compared with the previous month, but the bullion consignments have almost ceased. The October total of ore was 1,280.66 tons contained in 36 cars.

**Mining Corporation of Canada.**—The English merger of the Cobalt Townsite, the Cobalt Lake, and the City of Cobalt made its debut in the shipping list as the Mining Corporation of Canada. The Cobalt Lake ore is being treated in its own mill at the end of the lake and shipped separately, but the City of Cobalt and the Townsite is now despatched jointly. The ore is trammed from the City of Cobalt to the Cobalt Reduction mill, the Townsite is connected directly with the mill. The only shipment of ore on the T. & N. O. Railway outside the Cobalt camp and the Casey range was from the Tough Oakes mine at Kirkland Lake. Shipments of nickel from the Alexo mine have ceased altogether and the property has been closed down.

**Peterson Lake, Cobalt Silver Mining Company** has made declaration of the third dividend payable on December 10. It is of  $1\frac{3}{4}$  per cent., and amounts to \$43,032. The company has now paid  $5\frac{1}{4}$  per cent., or \$126,096. Peterson Lake dividends are now being paid solely out of the royalties from the Seneca Superior and Gould leases, as the company has come to the end of the ore found earlier in the year.

## PORCUPINE AND KIRKLAND LAKE

**Dome.**—For October both the grade of ore milled at the Dome mine and the tonnage treated showed improvement. Yet there was a falling off in the value of the gold produced of between three and four thousand dollars. The comparison between the months of September and October reads as follows:

Tons milled, September 21,940, October 22,500; value gold produced, September \$99,301, October \$95,880; value per ton, September \$4.52, October \$4.70.

**Porcupine Crown.**—Drifts beyond the fault to the south on the Porcupine Crown property continue in good ore which was not altogether anticipated by the management. Below the 500 ft. level the winze that is being put down is in ore although it is not of the same grade nor is the vein as wide as at the upper levels of the mine. The average gross production is about \$65,000 a month.

**McIntyre** production is being maintained at an average of between \$60,000 and \$70,000 a month, and the mill is treating a little less than 8,000 tons a month. Milling costs are now approaching a very satisfactory basis but mining costs owing to the large amount of development necessarily involved and the irregular character of the ore shoots are still high. With the help of a close geological study of the property, however, orebodies are being located with less dead work than formerly, and therefore less cost per ton. The



No. 5 shaft is now down to 300 ft., the No. 4 to 500 ft., and the No. 1 to 300 ft.

**Jupiter.**—There has been considerable activity in the Jupiter stock owing to some extent to the belief that the McKinley-Darragh-Savage Mining Company will take up the option which expires on December 15th. While nothing phenomenal has been discovered, recent developments have been satisfactory to the operators. No definite decision has yet been reached to take up the option. Since taking charge of the property in May the McKinley has opened up ore shoots on the 400 and 475-ft. levels. At the present time the western face on both levels is in a high grade ore shoot running right across the drifts. Three drills are running underground.

**Tough-Oakes.**—Good progress is being made with the new mill at the Tough-Oakes gold mine at Kirkland Lake. The contract for the building stipulated that it should be completed at the end of the year. Such activity has been displayed that it will probably be roofed in at least by the end of the present month. The small mill is now treating an increased tonnage of rock from the dump owing to the installation of a Hardinge mill.

The six-months' extension of exemption of work on mining claims till April 15, granted by the Government, is the logical conclusion of the three-months' extension granted from August. If the ordinary provisions had come into force in this month it would have meant little more than snow shovelling in lieu of work and a good deal of hardship to those prospectors who did intend to do bona fide work. Before April 15 there ought to be some revival in the demand for gold claims, and prospectors would then be more inclined to do their work in the hope of return.

## BRITISH COLUMBIA

Nearly all the mineral specimens from British Columbia intended for inclusion in the Canadian mineral exhibit to be made at the Panama-Pacific Exposition at San Francisco, California, next year have been shipped to that city from Vancouver. It is expected that, similarly to that made by the Dominion at the Alaska-Yukon-Pacific Exposition at Seattle, Washington, in 1909, the Canadian mineral exhibit will be the most comprehensive and regarded from the point of view of being generally illustrative of the mineral resources of the country it represents the best on display at San Francisco. While other natural resources of Canada will also be adequately represented, its minerals will certainly make a showing that should compel attention to the Dominion as well worthy of the careful consideration and enquiry by those prepared to engage in the mining industry in a commercial way. It is particularly fortunate that the Canadian Exhibition Commissioner has in the official in charge of the Mineral section one who has had several years' experience in this department and with all is tireless in his efforts to secure such a full representation of the minerals of Canada as to make the mineral section of especial value. So far as British Columbia is concerned, he has had the assistance and hearty co-operation of a mineral collector peculiarly fitted for that branch of the work, so it is not at all surprising to find that the collection of British Columbia mineral specimens is expected to be the best from this province ever shown at any exposition yet held. It has been announced that the exposition will be opened next February.

## Cariboo.

The placer-mining season is over for this year and hydraulicking operations have been stopped. On the whole, the year's results are believed to have been profitable where gravel-washing was done in considerable quantity. It is understood that while less gravel was handled on properties in the neighborhood of Barkerville than would have been had the water supply been larger, the amount of gold recovered was sufficient to leave a satisfactory margin of profit above the cost of operations, for in places the gold content of the gravel averaged higher than usual. Railway construction work is being continued, so the outlook for the provision of railway transportation facilities for the district is promising. When the Pacific Great Eastern railway from tidewater at the head of Howe sound (less than forty miles by deep water from the City of Vancouver) through Lillooet and Cariboo districts to Fort George, on the Grand Trunk Pacific railway, shall be completed, mining in Cariboo and Quesnel divisions of this district should give employment to a much larger number of men than it has done during recent years. Not only should there be a considerable increase in placer-mining operations, but both lode mining and the exploitation of coal areas should also be undertaken.

## Cassiar.

In this district, as well as in Cariboo, the value of the placer gold won during the 1914 gravel-washing season, will probably be found to be somewhat less than the estimate made at the beginning of the season, the chief reason for this being that less gold was obtained on O'Donnell river and tributary creeks than at the opening of the season was expected would be taken out on those streams. However, the year's total from the various creeks in Atlin division is still expected to be larger than that of 1913 which was \$315,000), in which case it will be the highest in six or seven years. Then Liard and Stikine divisions of the district are also likely to show an increase, with a total for the year of not less than \$10,000 as compared with \$9,000 in 1913, and there may also be small additions from other parts of this extensive district.

## East Kootenay.

Shipment of ore from the Sullivan Group mines is being maintained on a fairly large scale, the quantity received at Trail from that source during five weeks ended November 5 having been 4,562 tons, an average of 912 tons a week. While the average for four weeks ended October 1, was 1,233 tons a week, production during that month was unusually high. For nine months to October 1, the total of Sullivan ore received at Trail was 23,861 tons, an average of 612 tons a week, compared with which average that for October shows an increase of nearly 50 per cent.

On November 15 the Victoria "Daily Colonist" published an interview with Mr. Elias Rogers, of Toronto, president of the Crow's Nest Pass Coal Co., in the course of which occurs the following reference to the company's coal-mining industry in Southeast Kootenay: "Speaking of the position of the Crow's Nest Pass Coal Co., Mr. Rogers said the coal mining industry had been hard hit by the war, especially in the matter of coke production. At the commencement of hostilities the large copper-producing properties of the Boundary district had been compelled to close as the metal market was completely demoralized. There was little prospect of an improvement before the close of



the war. The payroll of the company's Crowsnest mines had been approximately \$200,000 a month; now, with the output curtailed to one-half, it is about \$100,000. The present output of coke is only about 600 tons a day."

#### West Kootenay.

**Ainsworth**—Only two mines in this division shipped ore during October, namely the Utica 35 tons and Rettalack & Co.'s Whitewater group 123 tons. The Kaslo "Kootenaian" lately published information concerning the discharge of a mortgage and a settlement of the financial affairs of the Utica company, in connection with which there had previously been difficulties that hindered the progress of development of the Utica mine and the production of ore. The hostile Eastern interests have been acquired by men also interested in other Ainsworth and Slocan properties, so it is expected that from this on good progress will be made and the Utica be developed into a productive mine to a much greater extent that was possible under conditions that have so greatly hampered operations. At the Cork-Provence property, too, the outlook for progress has much improved. At the Panama, situated at a high elevation in the mountains above Bear lake, which is on the divide between Kootenay lake to the east and Slocan lake to the west, development work is being continued, supplies for the winter having been packed up to the mine.

**Slocan**—The Rambler-Cariboo was the largest Slocan shipper of ore to Trail during October, 252 tons from that mine having reached Trail during five weeks ended November 5, the Hewitt (Silverton Mines Ltd.) coming next with 132 tons, and then the Ruth-Hope with 83 tons. There were several shippers of smaller quantities. District newspapers state that a contract has been let for hauling 10,000 tons of zinc-lead ore, from the dump at the lower terminal of the aerial tramway from the Surprise mine, to the Ivanhoe concentrator near Sandon. The distance between dump and mill is about two miles; as soon as there is sufficient snow on the ground the hauling will be good. For some time past the owners of the Surprise have been considering how best to deal with the problem of making marketable the considerable quantity of zinc-lead ore opened in their mine, and the decision to try concentrating it at the Ivanhoe mill is a move made with the object of solving that problem. Work has been resumed at the Slocan Star after two or three months' suspension that resulted from the stoppage of purchase of silver-lead ore by Consolidated Co., Trail. No information is available as to whether shipment of silver-lead concentrate to Trail will be undertaken by the Star management under the new conditions imposed by the smelting company, but in any case the zinc ore can be milled and the zinc concentrate made be shipped to the United States. Here, again, there is the difficulty of payment for the silver associated with the zinc, which in most Slocan zinc-lead ores is much more than the mine owners care to lose. Other mines in this division than those already mentioned at which work is being done are the Payne, Noble Five group, Reco, Noonday, Idaho, Standard and several others. Sale of the Muller Creek Mining Co.'s claims near Three Forks, under a foreclosed mortgage, has been advertised. A Slocan Lake man is authority for the statement that about 200 men are being employed by the Standard Silver-Lead Mining Co., which is operating both mine and concentrating mill near Silverton but for the time

being is shipping only silver-zinc concentrate, storing the silver-lead product until the market conditions shall improve. At the end of October the "Slocan Record" reported that 10 in. of clean galena had been encountered in a drift in the California mine, near New Denver. In Slocan City division the Enterprise, Eastmont and Meteor are among the properties on which work is being continued.

The Nelson "Daily News" a short time ago printed the following information relative to the shipment of zinc ore and concentrate from mines in Ainsworth and Slocan divisions: The increase in zinc shipments from Kootenay mines to zinc smelters in the United States for nine months of 1914, as compared with the corresponding period of 1913, was 6277 tons. Up to the end of September of this year 9141 tons of zinc ore had been shipped, against 2864 tons for the nine months of 1913. The proportions of the several mines that shipped this year were as follows: In Ainsworth division: U. S. 70 tons and Utica 73 tons, both crude ore. Slocan division: Hewitt 2,236 tons, Rambler-Cariboo 698 tons, Slocan Star 696 tons, Standard 4,516 tons, Van-Roi 863 tons; all concentrate shipments in October were; Hewitt (Silverton Mines, Ltd.) 278 tons, Rambler-Cariboo 173 tons, Standard 645 tons. The year's total to the end of October is 10,237 tons.

**Nelson**—Ore receipts at Trail from mines in Nelson division for five weeks ended November 5 totalled 450 tons, of which 356 tons was lead ore from the Emerald, H. B., and Zineton mines near Salmo, and the remainder ore and concentrate from three gold mines. There was little change in mining conditions and results during October as compared with September. About two months ago publicity was given to a statement relative to the reported occurrence in the mountains near the southern boundary line of Slocan City division and the northern line of Nelson division of ore giving on assay a gold value in excess of \$4,000 to the ton. After having spent five or six weeks at that high elevation and taken out a few tons of ore, the first reported determination of those most interested to spend the winter up there doing development work seems to have been abandoned; also the high-value talk, for the latter was not repeated when the announcement was printed that work had been stopped for the winter.

**Rossland**—After a longer delay than usual the Le Roi No. 2, Limited, has sent out from its London office its Josie mine reports for the months of August and September, as follows: For August: Shipped 730 tons of ore and 90 tons of concentrate. The receipts from the smeltery were \$23,445, being payment for 1,742 tons of ore, and \$2,038 for 124 tons of concentrate; sundry receipts \$678; total receipts, \$26,161. Estimated working costs for corresponding period were: ore production, \$5,000; milling, \$600; development, \$3,000; expenditure on Capital account, \$800; total, \$9,400. For September: Shipped 1,400 tons of ore and 50 tons of concentrate. Receipts from the smeltery were \$5,939, being payment for 454 tons of ore; sundry receipts, \$2,046; total receipts \$7,985. Estimated working costs for corresponding period were: Ore production, \$4,817; milling, \$423; expenditure on Capital account, \$723; total, \$5,963. The Rossland "Miner" reports that the Phoenix property, in the south belt of Rossland camp, has again been leased. Some good gold-copper ore was mined from the Phoenix by the last lessee, but the development work done was unimportant.

# MARKETS

## STANDARD EXCHANGE.

The minimum scale fixed by the Exchange, and below which no sales are premitted, is as follows:

### Cobalts—

Beaver. . . . .	.17
Buffalo. . . . .	.75
Chambers-Ferland. . . . .	.10
Canadian. . . . .	.05
City of Cobalt . . . . .	.30
Cobalt Lake . . . . .	.30
Coniagas. . . . .	6.00
Crown Reserve . . . . .	1.00
Great Northern . . . . .	.04
Hudson Bay . . . . .	30.00
Kerr Lake. . . . .	4.00
La Rose . . . . .	.70
McKinley-Darragh. . . . .	.40
Nipissing. . . . .	4.75
Peterson Lake . . . . .	.23
Seneca Superior . . . . .	2.00
Timiskaming. . . . .	.07
Trethewey. . . . .	.12
Wettlaufer. . . . .	.04½
York, Ont. . . . .	.07

### Porcupines—

Dome Extension . . . . .	.05
Dome Lake . . . . .	.30
Dome Mines . . . . .	6.50
Foley O'Brien . . . . .	.20
Hollinger. . . . .	16.00
Homestake M. F. . . . .	.20
Jupiter. . . . .	.04
McIntyre. . . . .	.27
Pearl Lake . . . . .	.02
Poreupine Crown . . . . .	.75
Poreupine Peterson . . . . .	.25
Poreupine Vipond . . . . .	.17
Rea Consolidated . . . . .	.10
Teck Hughes . . . . .	.07
West Dome . . . . .	.05

## STANDARD STOCK EXCHANGE.

Cobalt—	Nov. 24, 1914.	
	Ask.	Bid.
Bailey. . . . .	.017½	.015¼
Beaver Con. . . . .	.23	.21
Buffalo. . . . .	.85	.65
Chambers Ferland . . . . .	.13	.10
Coniagas. . . . .	5.85	5.00
Crown Reserve . . . . .	.80	.75
Foster. . . . .	.05	...
Gould. . . . .	.01	.00¼
Great Northern . . . . .	.04½	.04¾
Hudson Bay . . . . .	45.00	35.00
Kerr Lake . . . . .	5.00	4.75
La Rose . . . . .	.90	.78
McKinley-Darragh-Sav. . . . .	.69	.66
Nipissing. . . . .	5.50	5.20
Peterson Lake . . . . .	.28½	.28
Right of Way . . . . .	...	.02
Seneca Superior . . . . .	3.00	1.00
Silver Lake . . . . .	.02½	.02
Timiskaming. . . . .	.11½	.11
Trethewey. . . . .	...	.15
Wettlaufer. . . . .	...	.03½

### Porcupines—

Apex. . . . .	.02½	.01
Dome Extension . . . . .	.07	.06¾
Dome Lake . . . . .	.40½	.40
Dome Mines . . . . .	7.00	6.45
Foley-O'Brien. . . . .	.20	...
Gold Reef . . . . .	...	.01½
Homestake. . . . .	.20	.15
Hollinger. . . . .	19.00	18.75
Jupiter. . . . .	.12	.11¾
McIntyre. . . . .	.26	.25
Pearl Lake . . . . .	.03½	.02½
Poreupine Crown . . . . .	.90	.70
Poreupine Imperial . . . . .	.01	...
Poreupine Pet . . . . .	.20	.12
Poreupine Vipond. . . . .	.23	.22
P. E. D. . . . .	.02	.01
Rea Mines . . . . .	...	.12
Teck-Hughes. . . . .	.09½	.09½

## TORONTO MARKETS.

Nov. 24—(Quotations from Canada Metal Co., Toronto)—

Spelter, 5½ cents per lb.
Lead, 5 cents per lb.
Tin, 35½ cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 13½ cents per lb.
Electrolytic, 13½ cents per lb.
Ingot brass, yellow, 10c per lb.; red, 12c per lb.

Nov. 24—Coal—(Quotations from Elias Rogers Co., Toronto)—

Anthracite, \$8.00 per ton.
Bituminous, lump, \$5.25 per ton.

## GENERAL MARKETS.

Nov. 23—Connellsville coke (f.o.b. ovens)—

Furnace coke, prompt, \$1.60 per ton.
Foundry coke, prompt, \$2.10 to \$2.50 per ton.

Nov. 23—Tin, straits, 33.75 cents.

Copper, Prime Lake, 12.50 to 12.75 cents.
Electrolytic copper, 12.37½ to 12.50 cents.
Copper wire, 13.75 cents.
Lead, 3.90 to 3.95 cents.
Spelter, 5.25 to 5.30 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 17.00 to 17.50 cents.
Aluminum, 19.00 to 19.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, hard, 10 per cent., \$48.00 to \$50.00 per ounce.
Platinum, soft, \$44.00 to \$46.00 per ounce.
Bismuth, \$2.75 to \$3.00 per pound.
Quicksilver, \$52.50 per 75-pound flask.

## SILVER PRICES.

November—	New York London	
	cents	pence
10. . . . .	49¾	22¾
11. . . . .	49	22½
12. . . . .	48¾	22½
13. . . . .	47¾	22½
14. . . . .	47½	22½
16. . . . .	48¾	22½
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Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.

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Memoir 40. The Archaean Geology of Rainy Lake Re-studied, by Andrew C. Lawson.

#### NORTH-WEST PROVINCES

Memoir 47. Clay and Shale Deposits of the Western Provinces, Part 3, by Heinrich Ries.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

#### BRITISH COLUMBIA

Memoir 19. Mother Lode and Sunset Mines, Boundary District, B.C., by O. E. LeRoy.

Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.

#### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

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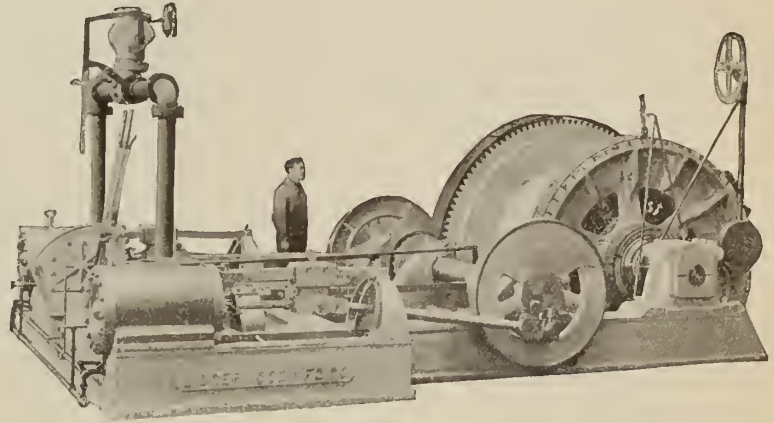
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**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is \$10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.

*When answering Advertisements please mention THE CANADIAN MINING JOURNAL.*

# Ontario's Mining Lands

---

There are many millions of acres in Eastern, Northern, and Northwestern Ontario where the geological formations are favorable for the occurrence of minerals, the pre-Cambrian series being pre-eminently the metal-bearing rocks of America.

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Many other varieties of useful minerals are found in Ontario:—cobalt, arsenic, iron pyrites, mica, graphite, corundum, talc, gypsum, salt, petroleum, and natural gas.

Building materials such as brick, lime, stone, cement, sand and gravel, are abundant.

The output of the mines and metallurgical works of Ontario for the year 1912 was valued at \$48,341,612, and for 1913 this amount will be materially increased.

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water.

A miner's license costs \$5.00 per annum, and entitles the holder to stake out three claims a year in every mining division.

For maps, reports of the Bureau of Mines, and mining laws, apply to

**HON. W. H. HEARST,**

Minister of Lands, Forests and Mines,

**Toronto, Canada.**



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Mussens, Ltd.  
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- Coal Washeries—**  
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Mussens, Ltd.  
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Northern Canada Supply Co.
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MANITOBA:	-	-	-	-	-	-	Winnipeg
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- Fuse—**  
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- Beaters—Feed Water—**  
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Peacock Bros.
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- Hoists—Air Electric and Steam—**  
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Peacock Bros.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
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Peacock Bros.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Sullivan Machinery Co.  
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Mussens, Ltd.
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Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Jacks—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
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- Jigs—**  
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Mussens, Ltd.  
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Mussens, Ltd.  
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- Link Belt—**  
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- Locomotives—Electric—**  
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Jeffrey Mfg. Co.
- Locomotives—Steam—**  
Mussens, Ltd.
- Metal Merchants—**  
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Canada Metal Co.
- Monel Metal—**  
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## Aggregate Value of \$460,433,920

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1888, inclusive, \$69,598,850; for five years, 1889-1893, \$15,079,632; for five years, 1894-1898, \$38,738,844; for five years 1889-1903, \$83,807,166; for five years, 1904-1908, \$116,153,067; for five years, 1909-1913, \$137,056,361.

## Production During last ten years, \$253,209,428

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

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High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

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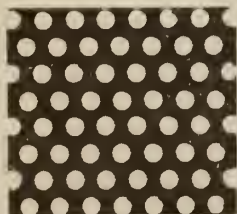
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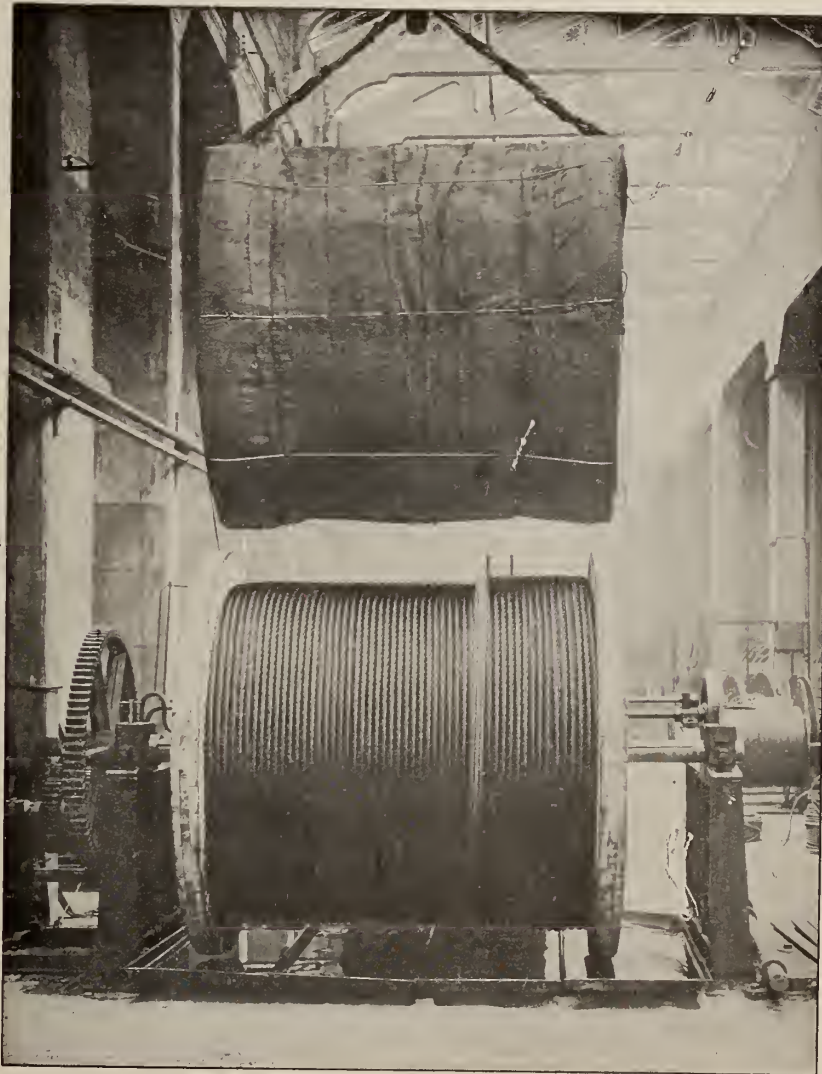
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No. 24



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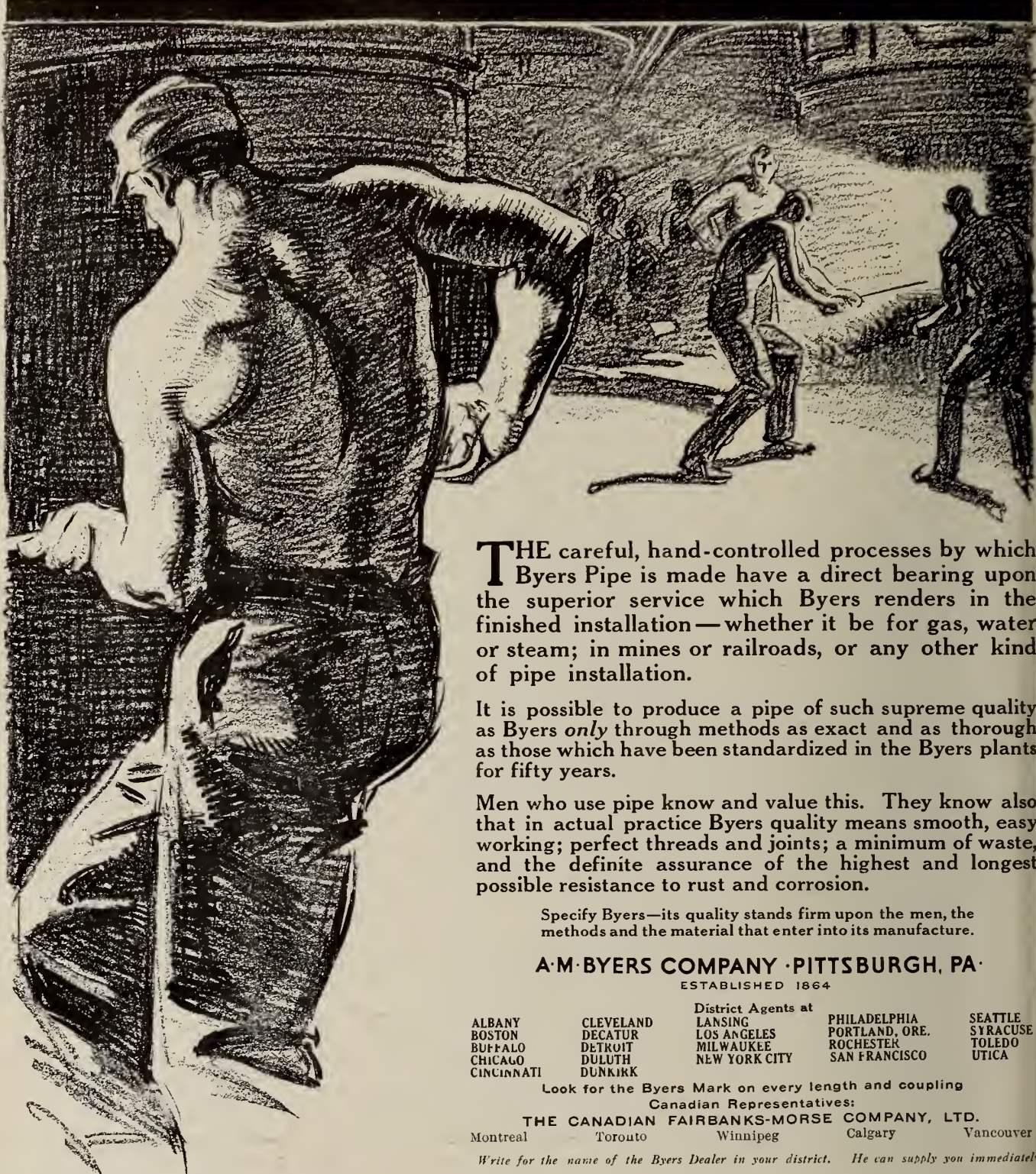
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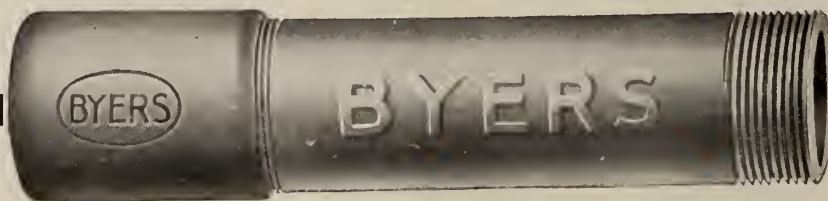
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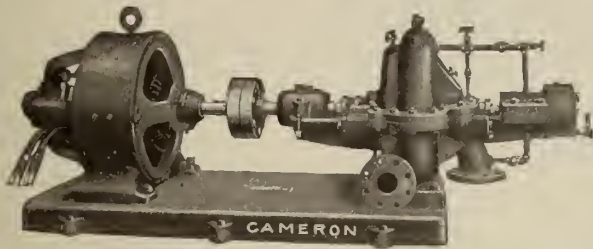
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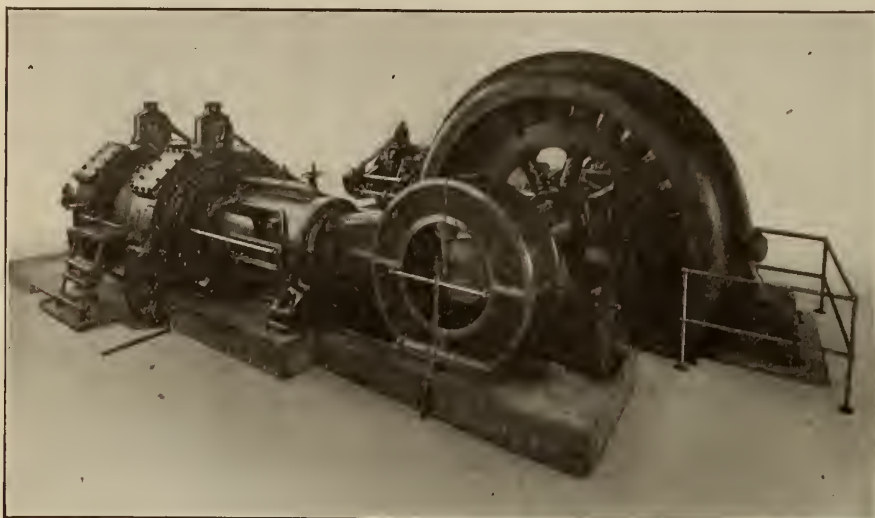
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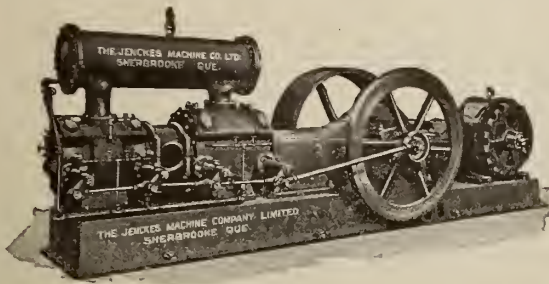
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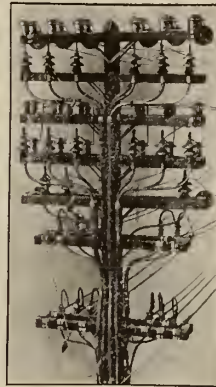
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## Synopsis of Coal Mining Regulations



**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

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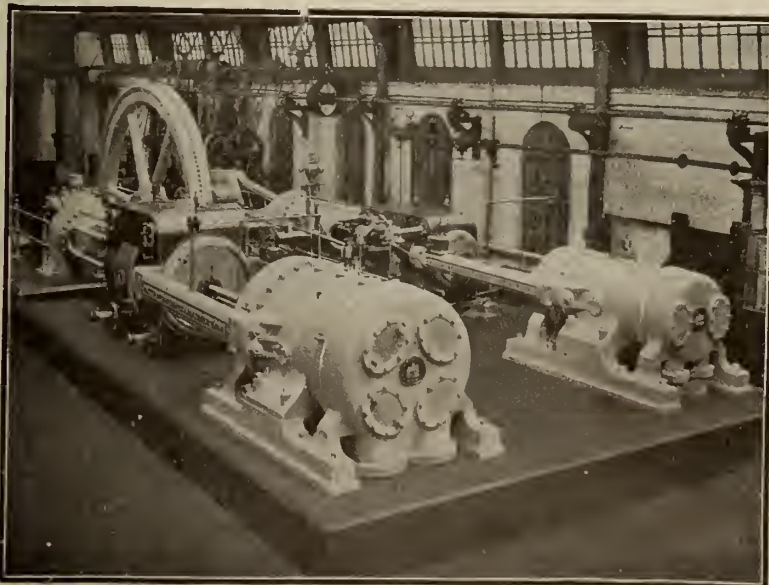
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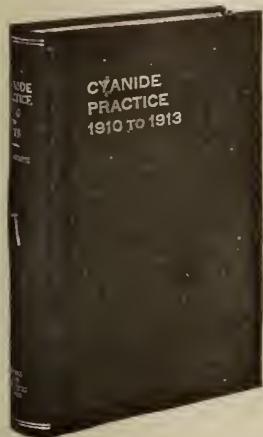
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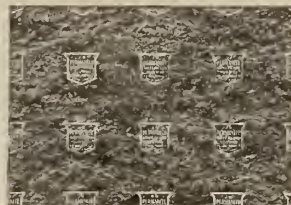
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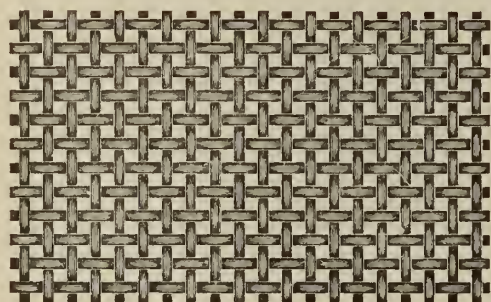
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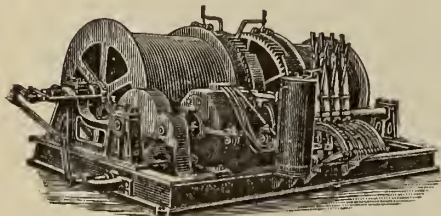
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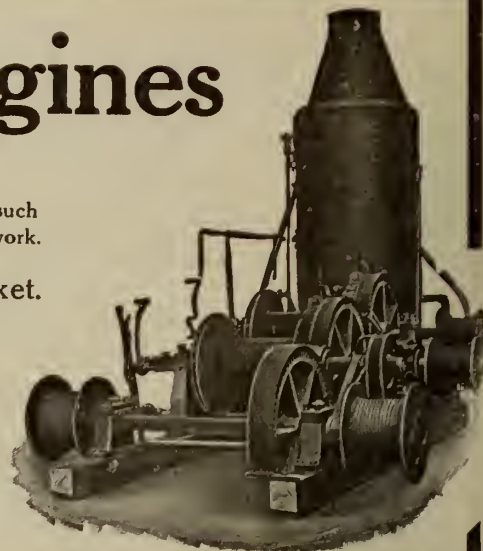
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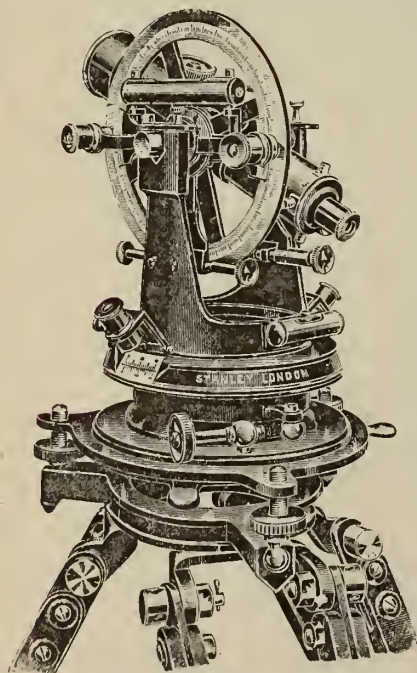
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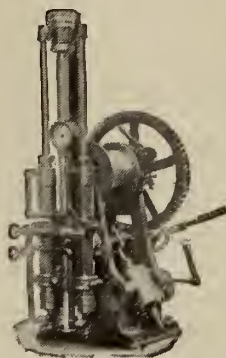
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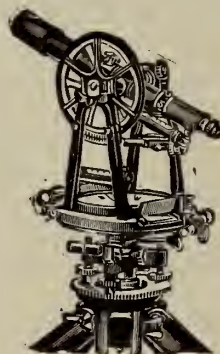
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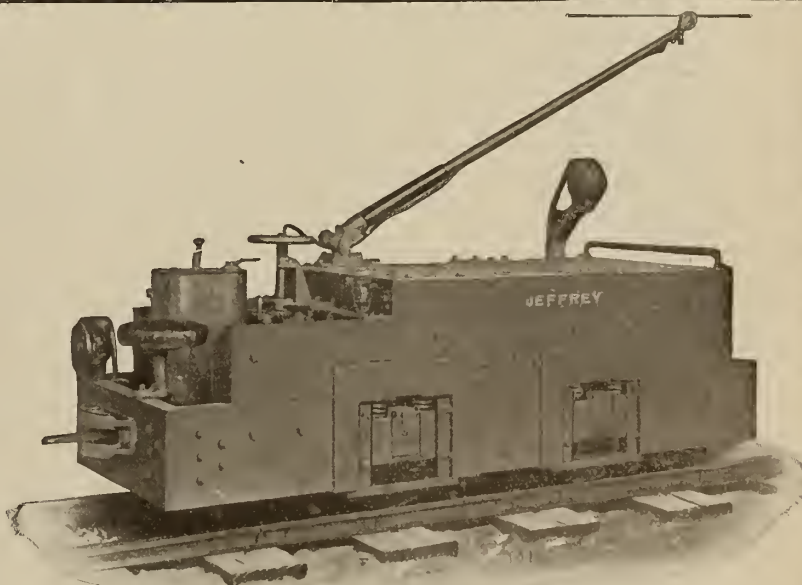
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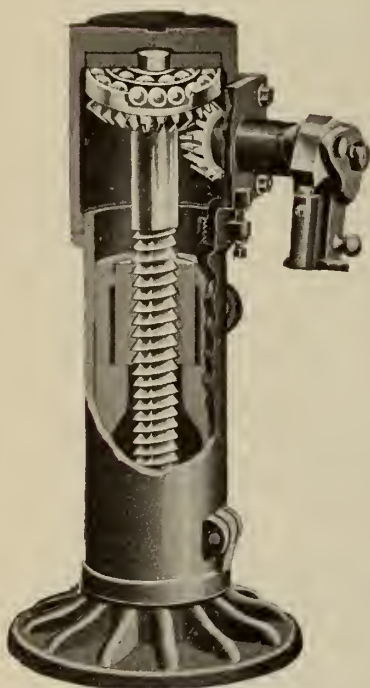
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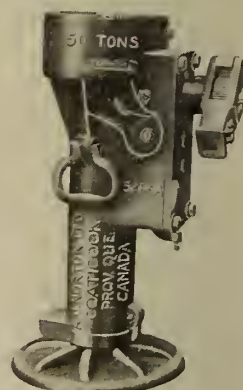
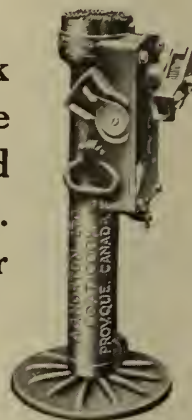
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# THE CANADIAN MINING JOURNAL

VOL. XXXV.

TORONTO, December 15, 1914.

No. 24

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office . . . 2nd Floor, 44 and 46 Lombard St., Toronto  
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Editor

REGINALD E. HORE

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### CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

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## THE NICKEL QUESTION

The exportation of nickel is still engaging the attention of some of the daily newspapers. In its issue of Dec. 9 the Toronto Star has an editorial discussing the editorial in our last issue. On Dec. 10 the London correspondent of the Mail and Empire, like the Star, advocates prohibition of the export of nickel to the United States, on the ground that some of it might reach the enemy.

This, to us, seems a short-sighted policy, and one calculated to do more harm to the Allies than to the enemy. We agree that extreme care should be taken that nickel won from Canadian ores should not be obtained by Germany for use against us. But to prevent the chance of an occasional shipment escaping the watchfulness of the War Departments of the Allies our contemporaries would go to the extreme of preventing anyone from obtaining nickel from the International Nickel Company, by forbidding the shipment of matte from the furnaces at Sudbury to the refineries in New Jersey.

We have in Canada neither nickel refineries nor plants for working nickel into nickel-steel. Consequently, to place an embargo on nickel matte outside the Empire would mean that we should export only enough matte to supply the Mond Company's smelter in Wales, close down large mines and smelters in the Sudbury district, throw many men out of work, and cut off a large source of supply of armament for the Allies and friendly neutrals.

Our contemporaries are to be congratulated on their watchfulness of the interests of the Allies and on their desire to cut off the enemy's supply of nickel. But the circumstances are such that their efforts seem likely to result in more assistance to the enemy than to anyone else.

It has yet to be established that nickel won from Canadian ores is reaching the enemy. It is of course probable that he is trying to obtain a supply; but we have no evidence of his success. If the British War Office is of the opinion that nickel is being obtained by Germany some restriction will necessarily be made on the export of matte. But until there is more ground for believing the protection afforded by the navy and the agreements made with neutral powers inadequate, there is no need of extreme measures. In any case a general embargo would not be desirable.

In its issue of December 11, the Mail and Empire says:

"If, as is reported from London, nickel from the United States is reaching Germany, the Canadian Government will doubtless have its attention officially

drawn to the fact, and can be depended upon to use effectively any powers it has to stop that contraband traffic. As it is, no nickel produced from Canadian ores can be going forward to enemy countries except in disregard of the Canadian Government's authority. By an order-in-Council passed and brought into force several weeks ago, the Government prohibits the exportation of Canadian nickel to any but friendly countries, and an arrangement for checking exports from United States refineries using our matte is being carefully carried out by Canadian Government officials.

"If nickel of Canadian origin continues to reach Germany despite this prohibition, and these precautions, then the Government cannot refrain from the thoroughgoing course of completely barring the exportation of nickel ore, matte and refined metal to any country save the United Kingdom. That would be an effective and simple way of eliminating the risk of the enemy's getting any benefit of our nickel resources. By adopting that course our Government could assure itself as to the destination of every pound of the product of our nickel mines that is shipped out of the country. The moment that exports get beyond our Government's control the danger of diversion from the markets of friendly countries to those of the enemy becomes hard to guard against. No matter how good the faith of United States refiners may be, they cannot be expected to guarantee against mischances and smuggling on the part of carriers or dealers in whose honor they have to trust. By restricting nickel exportation to accredited persons or firms in the United Kingdom, our Government would not only baffle German bargainners, but it would save the British Government much trouble and spare it much friction with neutral Governments. If no Canadian nickel ore or matte were allowed to enter the United States, there would be no chance of United States merchant vessels engaging in a contraband trade in Canadian nickel. There would then be no need for British warships to halt United States merchant ships for the purpose of ascertaining whether or not they were carrying Canadian nickel to the enemy. Hence, there would be no hazarding of the good relations between Britain and the United States on that account. By prohibiting nickel exports to foreign countries we can best stand by Britain in the premises."

The Mail and Empire is correct in stating that to completely bar the export of nickel ore, matte and refined metal to any country save the United Kingdom would be an effective and simple way of eliminating the risk of the enemy's getting any benefit of our nickel resources. But, like the Toronto Star, the Mail and Empire seems blind to the fact that most, if not all, of our present trade is with friendly countries, and the Mail and Empire does not offer any evidence that Canadian nickel is reaching the enemy.

In the same editorial we find the following:

"At the present time the naval construction yards and armament works of Germany are being operated

to their maximum capacity. The shipbuilders, the ship armorers, the manufacturers of big guns for Dreadnoughts and super-Dreadnoughts are straining every nerve to add to Germany's naval strength. Construction is being accelerated at a headlong rate, so that when the time for fighting comes Germany's line of battle will be as formidable as it can be made. For every ounce of nickel it can buy the German Government is now prepared to pay double or treble the market price. Nothing this Government can do to keep Canadian nickel out of Germany's reach should be left undone."

Does the Mail and Empire imagine that activity in construction is confined to Germany. If the Allies and neutral countries found it necessary to buy nickel before the war, do they not need nickel now. Are they so frightened of Germany that they are willing to do without what they want in order to prevent any possibility, and it is a mere possibility, of Germany obtaining nickel from the same source.

## REFINING NICKEL IN CANADA

The Toronto Star asks, "How long would it take to establish a nickel refinery in Canada." We regret to be unable to give a very satisfactory estimate. Nickel refineries are not common, and those in existence are the result of many years' growth. We might expect an experienced company to be able to erect a plant in a few months. How much longer it would take to "establish" it we cannot venture to guess.

We suppose the Star has in mind a refinery which can be economically operated. Such a plant was very much desired by the Canadian Copper Company before that company was merged with the Orford and other companies in the formation of the International Nickel Co. Back in 1889 Dr. Peters, the company's metallurgist at that time, proposed a refinery at Cape Breton, where supplies could be more cheaply assembled than in Ontario. After some study of conditions the proposal was dropped. Then in 1890 the Canadian Copper Company retained Jules Garnier to do his utmost to solve the refinery problem. Mr. Garnier's experiments cost \$150,000, and the results were unsatisfactory.

Later a plant was erected at Hamilton by the Hoepfner Refining Co. This attempt also failed.

In 1895 the Canadian Copper Co., still anxious to establish a refinery in Canada, sent its metallurgist to Wales to study the Mond process. This, after a year's study, was not thought suitable for a local establishment, however. The process is being now satisfactorily used by the Mond Nickel Co., but not in Canada. Both companies were evidently of the opinion that the Mond process could not be economically successful if the refinery were located here.

There is no doubt whatever that nickel can be refined in Canada, and we sincerely hope that in the near future it will be. Up to the present, however, the In-



ternational Nickel Co. and the Mond Nickel Co. have not found the proposition an attractive one.

If then we return to the Star's query, we may say that the Canadian Copper Co. endeavored for several years to establish a refinery here and spent a large sum of money without success. It does not necessarily follow that future attempts are destined to failure, but enough has been learned to warrant the belief that the present practice is economically the best and that the length of time it will take to establish a refinery in Canada will be determined by the length of time that conditions remain as they have been.

The Star may be of the opinion that the conditions brought about by the war are such as to warrant the establishment of a refinery here at any cost. And there may be many of the same opinion. But suppose the refinery established. What shall we do with the nickel. We cannot roll it into nickel-steel, the form in which most of it is sold. The Carnegie nickel-steel plant is said to have cost \$500,000. Shall we build such a plant? Shall we prohibit the shipment of nickel or nickel-steel to the United States and force this friendly country to look elsewhere for nickel for her army and navy?

Evidently the establishment of a refinery in Canada would not settle the question.

## NOVA SCOTIAN COAL PRODUCTION IN 1914

An approximate estimate of the coal production of Nova Scotia for 1914 indicates a reduction in output of about half a million tons when compared with 1913, and it is probable that the output for the Province for 1914 will not exceed 7,000,000 tons. The major portion of the reduction has been caused by the falling-off in the demand for coal for steel-making purposes. The export of coal from the Province reached the highest figure in the history of the coal mines. Shipments to the St. Lawrence during the season just closed were at least 300,000 tons in excess of any previous year's figures. The demand for coal for household and manufacturing purposes was fairly well maintained, considering the unusual conditions which have prevailed during the year.

The outstanding feature of the year has been the increase in water shipments during war time, a subject on which much might be said, and to which fuller reference will be made in a later issue.

Taking all the factors into consideration, the reduction in output is less than might have been anticipated, and indeed some of the smaller companies have made slight gains.

The production during November and December will, however, be very much smaller than usual, as in view of the uncertain outlook the coal companies are taking conservative action with regard to the banking of coal. The coal-banks put down last winter were

abnormally large, and while the banks which will be put down during the ensuing winter will be very much smaller than last year's stocks, they will be equal to any winter stocks accumulated in the winters prior to 1913-1914 season.

While there is very little hope for great demand for heavier steel products, there are signs of a renewal of activity in some of the lighter grades of finished steel articles, such as barbed wire and wire rods. Some renewal of activity is reported in pig iron sales, but so far this has not affected conditions in Nova Scotia. Any increase of output in the steel trade will of course favorably affect the coal trade.

As a good deal of the ordinary commercial winter business of the coal companies is for screened coal, and as the consumption of the steel works consists chiefly of slack coal for coke making, the coal companies are facing unusual difficulty in the disposal of slack coal, and therefore unusual interest attaches at the present time to the reduction to the lowest possible minimum of the slack coal made in the process of mining and to transporting the coal. The situation is quite unusual, because since the great expansion in the steel industry in Nova Scotia, dating from about 1900, the demand for coal for steel making purposes has been a steadily increasing one. It is therefore apparent that the indications of a slight revival in the steel trade are being watched with interest by those connected with the collieries in Nova Scotia.

Generally speaking, the indications are that the coal mines in Nova Scotia will work from half-time to three-quarter time during the next six months. Some collieries will do better than this and others will not be so fortunate, but, on the whole, there seems to be no reason to anticipate full-time work at the collieries before the opening of navigation in 1915. There are many varying factors to be considered, and over and above all the great fact of the war, but the two most encouraging factors are that manufacturing generally seems to be holding its own, and that the outlook in the steel trade is better than it was.—F. W. G.

## GUARDING THE PROFESSION

At the recent meeting of the Canadian Society of Civil Engineers, Professor H. E. T. Haultain called attention to a function of engineering societies which has been more or less neglected. In his paper, which is published in this issue of the Journal, Professor Haultain asks engineers to consider whether they are doing their part in advancing the profession in the estimation of the public. Should engineers be willing to let their work speak for itself? Should they not at least see to it that the listeners are in a receptive mood and that they hold the profession in esteem?

Most engineers object to anything in the nature of advertising. They are willing to go quietly about their work and they look askance on any member of their profession who believes in publicity.

Men who do their work well and say little or nothing about it win respect. But this is due to the fact that people have learned that their work is good. They learn in many ways. A few, a very few, have the ability and opportunity of judging from the work itself. Others learn from friends and associates. Naturally, in most cases, it is a small circle that knows of the ability of the average engineer. The engineer has reason to be satisfied if included in that small circle are his employers and prospective employers.

But even the engineer who shuns publicity for himself may feel with Professor Haultain that publicity for the profession is to be desired. If it is desirable, what steps should the engineering societies take to obtain it?

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In view of the increase in interest in gold mining that has followed on the successful development of the Porcupine district, it is to be hoped that something will be done to encourage the proving up of some of the very numerous properties that have been located in the past few years. Scores of prospects have for various reasons not received the attention they merit. In many cases no doubt this is due to lack of willingness of the prospector to part with his claim on reasonable terms. He cannot test the property himself, and is unwilling to allow developing companies to make tests without paying large sums in cash for the privilege. Many prospectors would like to develop their properties themselves; but are unable to do so without costly machinery. If customs mills for treating gold ore were available there would doubtless be more small gold deposits worked.

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The United States Geological Survey has published a little bulletin entitled "Our Mineral Reserves—How to make America Industrially Independent." The author is Mr. George Otis Smith, Director of the U. S. Geological Survey. The bulletin is an excellent summary of the mineral resources available for utilization under the pressure of present conditions.

Our attention has been drawn to a very erroneous statement in this bulletin, however. Speaking of the treatment of foreign ores in U. S. smelting plants Mr. Smith says: "Nickel having a value of \$19,000,000 and nearly an equal value of pig iron was produced last year from foreign ores, obtained mainly from Cuba."

As a matter of fact practically all the nickel produced in the United States is won from nickel matte shipped from smelters in Canada to New Jersey for refining. The nickel ore is produced in the Sudbury district, Ontario.

It is true that a large quantity of iron ore from Cuba is smelted in the United States, but it could hardly be inferred from Mr. Smith's paper that the nickel did not also come from Cuba.

Members of the Canadian Mining Institute in Northern Ontario will regret to learn that the annual meeting next March is not to be held at Cobalt. It is generally recognized that the meeting is not likely to prove the great success that others have been on account of the war conditions. The Cobalt branch was willing to undertake the burden and deserves a great deal of credit for its willingness to take the load off the other branches. Apparently the Council did not wish to hold the initial meeting at Cobalt under such trying circumstances, thinking that Toronto, having a record of several very successful meetings to its credit, was in a better position to stand the stigma of a slimly attended meeting. It is to be hoped that the invitation of the Cobalt branch will be renewed at a later date and that the Council will accept it.

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According to the December bulletin of the Canadian Mining Institute, the letter sent out to members of the Mining Society of Nova Scotia concerning affiliation with the Institute is not to be interpreted as meaning that they may become members of the Institute upon the payment of an annual fee of five dollars per annum. What then does it mean?

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In a letter to the Secretary of the Canadian Mining Institute, Mr. David H. Browne, of New York, gives it as his opinion that the great field of usefulness of Government Bureaus lies not in publication, but in investigation. We take it that Mr. Browne is in favor of widespread publication of the results of investigation, however. Otherwise investigation would lose much of its usefulness and there would be great duplication of effort.

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Mr. Norman T. Fisher in a letter to the Secretary of the Canadian Mining Institute urges that a greater force of geologists should be put in the field so as to enable the activities of the Mines Department to be extended in various directions. He seems to be under the impression that geologists might be made of some use to the mining industry. We commend him to the attention of Professor Haultain.

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Encouraging reports come from the mining districts in British Columbia and Northern Ontario. Porcupine is one of the most flourishing districts in the Dominion, the gold mining industry being almost unaffected by the war. At Cobalt there is not such marked activity as at Porcupine; but the silver mining district is doing fairly well. Last week the Buffalo mine resumed at full force, and now all the larger producers are active. In British Columbia it is reported that the Granby Company, which is obtaining excellent results at Hidden Creek, will shortly resume operations at Phoenix and Grand Forks. The Crowsnest district coal mines are also reported more active.

Mining, like other industries, has been adversely affected by the war, but the men in charge of operations are proving equal to the emergency.



## THE ENGINEER\*

By H. E. T. Haultain.

The majority of the papers read before this Society are descriptions of work accomplished, descriptions of successful results, accompanied by detailed plans and specifications. This effort of mine is as far removed from this type of paper as it is possible to go. It is but a groping. Perhaps it would be more becoming the dignity of this meeting if it were referred to as a reconnaissance; but the region of the survey is not new. It is one we have all looked at. But by most of us it is passed by as being unfruitful or unpleasant. Safety and success are the prime essentials for much of the work of the Engineer, with the result that where he cannot see clearly, he is the more timid. He avoids doubtful material; where he cannot avoid he raises his factor of safety. He will rarely talk of his mistakes, though they may be of much greater educational value than his successes. In fact, he will rarely talk in public about his work except in the form of plans and specifications. Yet I am venturing before you with my groping. One reason for this is that of late I have viewed the subject from a new standpoint one far removed from that of the field engineer.

Last year the President of the Institution of Mining and Metallurgy, said to me:—"You are at a gate of the profession, what are you doing to guard it?" Part of my function as a teacher is to guard the profession as is also part of the functions of this Society. If I am at a gate-way you are at the citadel. I submit that it is probable that the activity of this part of our functions might with advantage be very materially increased. Perhaps it is still more important that the range of this activity should be widened. Many will say that the profession is being well guarded, that the standard is high, is in fact very much higher than is generally realized. With this I would agree, more particularly with the last part. Is it not possible that this is a point that we have been neglecting.

A recent editorial in the University of Toronto Monthly, contained a reference to "the feud in Medicine and Applied Science between the practical and the genuinely University conception of training."

I do not think that the word feud expressed the idea satisfactorily, but the condition referred to has impressed me more strongly than any other academic condition in the six years I have been in the University. There seems to be a wide gulf between the older faculty of Arts, and the faculty of Applied Science and Engineering. In the picture, as it appears to many observers, the bright light and the high land is on that side of the gulf away from the Engineers. In fact, in a general view, there is not a gulf which betokens an equality of level between the two shores, there is rather the appearance of high mountains and valleys. There is no doubt that there is a haze of misunderstanding between the two.

I do not know that this atmosphere does any harm or causes any more unpleasantness than does occasional bad weather. I sometimes think it may be a sign of health. Perhaps if it were intensified it might stir up some healthy activity. I bring it in only as an illustration. Is it not exactly the same way out in the field,

though the picture may be obscured by many conditions absent in the smaller academic world. Are not the Engineers, in the eyes of the public, but hewers of wood and drawers of water?

Possibly it is sufficient that we remain so and confine our attention to the wood and the water as becometh men of low degree. Without doubt the general attitude of the Engineer is one of indifference in this regard.

Is it not possible that this is the real problem before the Engineering societies? Is not this really the whole of which the other problems are but parts?

If this condition is to be changed, how is it to be accomplished and who should attempt it? Engineers do not talk about engineering, except to themselves and in their own language. It is nobody's business to talk about it for us. Others misunderstand us because they do not know us. They recognize that we are different from them. We must be either inferior or superior. Naturally they think we are inferior. Can you blame them? We take the trouble neither to dress nor speak the part.

One reason, without doubt, is that our work is intensely interesting and we are so busy with it that we have neither the time nor the energy to pay attention to anything but our work. Probably another reason lies in the fact that we are so accustomed to putting our ideas in the form of plans and specifications, that not only do we find other language difficult, but we avoid expressing ourselves on any subject that has not formed itself in our minds clearly and distinctly. An elaboration of details which the Engineer's mind demands, only befogs the public or robs them of their interest. Broad impressions, sometimes purposely distorted to what the Engineer would consider inaccuracy, attract and educate the public.

We all shy from the question, "What is Engineering?" It appears an unprofitable and tiresome subject. I am inclined to submit, however, that some of us, at least, should tackle it and keep on tackling it. It is neither possible nor necessary to draw complete plans and specifications; but we must produce a general view that will convey correct impressions, not only to ourselves and to those entering at the gate, but also to the outside public. Do we think the lawyer or the business man or the man about town has anything like a true understanding of the Engineer and his ideals? Are we not quite sure in our own minds that their ideas on the subject are very far from the truth. I am perfectly sure that the ideas concerning the Engineer and Engineering held by the University Senate are very materially different from those held by the teachers in the Engineering faculty. An Arts professor, who has been associated with the Engineering faculty throughout his academic life, said to me:—"I have no patience with your ideas of education. Your only reason for wanting analytical geometry is to enable you to cut out boiler plates." I could hardly frame a statement that would be further from my ideas of education and yet I failed completely to convey this to my colleague. The association in his mind between

\*A paper read before the Canadian Society of Civil Engineers in Montreal on Nov. 5th, 1914, under the title of "The Wielder of the Weapon." The paper was preceded by some slides, one of which showed clause 2 of the Engineering Ethics section of the By-Laws of the Can. Soc. C.E. Mr. Haultain said that he sought a broad interpretation of the last part of the clause, viz.:—"The surest way for an Engineer to obtain such necessary consideration and deference from the public will be found in his manner of carrying himself." Another slide showed the man of Coreze with his club and stone.



the high mental training of such a subject and the Engineer reached only to the cutting of boiler-plates.

Another colleague inferred that the difference between Science and Applied Science was something like the difference between wall paper in the roll and on the wall. All the great art and skill lay in the roll. The applying it to the wall was a simple matter; a matter of low degree.

What then is Engineering and who is the Engineer. If he is not simply a hewer of wood what is he? Does he belong to any specified herd or are we all mavericks? Is there a distinguishable brand on our hide or are there only irregular and uncertain marks proving only that we are not exactly wild beasts. Are we sufficiently gregarious to constitute a herd, or is it that there are only a few of this kind and do they only herd from fear. Evidently the simile is badly taken.

Are we a tribe—if so wherein do we differ from those outside the tribe? Have we inherent characteristics? Are we differentiated from other tribes. Have we any tribal pride and of what are we proud. Or are we simply content to be the vassals of the community. Are we leaders or simply workers.

I am inclined to think that the simile of the hewer of wood is at the base of most of the misunderstanding. Let us go back to the beginning of things, to the dim red dawn of man. Did not the man of Coreze represent at his time the greatest force in the world. Was he not above all the animals. Wherein was he different from them. Was it not probably in the fact that he used forces outside of himself to win from nature. Was he not the inventor and the first user of the weapon. Was not the wielded club or thrown stone the first step towards the separation from the brute. From then until now who has always been the greatest man? Let me quote from my paper, "The Geologist."

"When we go back to the beginning of things, that is to the beginning of things for man, to about the times, let us say, of *pithecanthropus erectus*, the story teller was beginning. He was almost the first luxury. Possibly man's first distinction was that he was a fire-using animal. Certainly about the same stage of his development he became a story telling and story hearing animal, and the story telling part was certainly more removed from mere animal than any other phase of his activities. Progress in all stages has been based largely on co-operative organization and this came first with the fighting animal but organization alone did not win out from the animal stage. Organization could and does exist without language and without man, but we departed from the animal through language and progressed through language. Language was produced by and for the story-teller. For his purpose was language developed and without language we would have had no modern man. The neolithic scribe on bone, that "mammothistie etcher at Grenelle," was a later development of the story teller, who told stories in pictures and was not only the forerunner of the comic supplement, but of all that we understand in modern pictorial art. Later he told stories in song and in mimicry so that all our art, which represents our greatest departure from the anthropoid ape, is the work of the story teller.

"Now the story teller is still the greatest man among us. What does Kipling get per word? And has he not had the refusal of the high honors of the realm?

Theodore Roosevelt received \$350,000 for seven years' work as President of the United States but received a million dollars for the story of his African holiday."

Man was a weapon wielder before he was a story teller. The weapon wielder was the real leader. We always have and always will look up to the story teller but we bow down to the successful wielder of the weapon. He has had more of the world's real adulation. Though he may use the same weapon he is the antithesis of the hewer of wood. The conquered slaves, the weak and the imbeciles were the hewers of wood and the drawers of water. It is true that they won something from nature, but they made no progress and they risked nothing in the effort. Man's struggle against man has been only a small part of the sum total of his effort as compared with his struggle with nature and the struggle with nature to-day is more universal, more rapid, more intense and more successful than ever before. The man in the forefront of the struggle, he who is forcing nature to the use and convenience of man as never before is the Engineer and the reason that he progresses more rapidly and more successfully than ever before is largely on account of his new weapons but still more on account of himself and his methods. His weapons are drawn from the sciences but the wielding is his own. The choosing of the weapon and the plan of campaign are his. But he is in the thick of the fight and there are no war correspondents. He makes no effort to hold communication with non-combatants. He is busy for results and to him nothing but results counts. He has not yet arrived at the stage of holding communication with the public through means of show and parade, of brass bands and uniforms. No slave toiling at the wood pile ever shrank from the public gaze more carefully than does many an Engineer from publicity. He is content to stand behind his wood pile and the public thinking that the pile arrived by a simple process of hewing give as little attention to the man as to the slave. Nobody tells the public that to produce the modern pile there has been a struggle calling upon higher standards than ever before in the struggle with nature that the men who are winning in this struggle are men of as high a calibre in mental effort and moral fibre as in any other branch of human affairs and very much higher than in most other callings.

We do not dress the part. To the public eye dignity and weight of personal character are intimately associated with gown and wig and valor and worth with uniform and decorations. We have neither religion nor law nor military without their wrappings which tell to the ordinary man plainer than any words that the man within is of high worth in the general scheme of things. We neither talk nor dress the part. We are pleased to say that we work and that workers don't talk. As a matter of fact we fight. The word work only covers a part of our efforts. We wield weapons and plan campaigns and we risk personal safety in reputation, if not in limb and life. Some will say that the fighter also doesn't talk. No, he does not talk the part, he dresses it. I can't imagine Lord Roberts liking the fuss and feathers; but he is punctilious to a degree in such matters. And we Engineers, with the exception of a few whom we rather blame for "advertising," do nothing—absolutely nothing to tell our fellows what manner of men we are. Is it not possible that this is the real problem before this Society. We cannot wear a uniform either in the shape of helmet and tunic or of wig and gown, nor can we have parades and brass bands.

\*"The Geologist"—a paper read before the Canadian Mining Institute in March, 1913, and published in the Annual Volume for that year, No. XVI., and also published in The Canadian Mining Journal, March 15th, 1913.



Publicity of some kind we need more than anything else; but it must be of the right kind and apparently the right kind has still to be discovered. We must recognize that there are innumerable kinds of useful publicity and that many, very many, most extraordinary ones are really good form. General French can wear white feathers in his hat. Among the University staff one of the most respected translates very feeble limericks into what I am informed is excellent Greek, and publishes it. A judge is never so impressive as when garbed in his wig and gown, which look only absurd under other circumstances. But these are all hallowed by time and are denied to us. We are so young that language itself is denied to us. Our very name is without meaning or what amounts to the same thing, has many meanings, and so with many other words connected with us, technical, practical, scientific, theoretical and so on. But the means of publicity, though many, may still be added to. The magnificent home of the Institution of Civil Engineers must by its dignified appearance alone be of great educative importance. The knighting of Sanford Fleming was not without its value; but needs repetition as does all publicity. "There are certain conditions of intimacy, continuance and repetition which are necessary if an idea or feeling is to gain a foothold in the mind and remain." At the celebration this year of the addition of the word Royal to the name of the Canadian Institute, an organization founded by Fleming 60 odd years ago, a speaker of the evening not content with Sir Sanford's reputation as an engineer labored to show that he was a scientific man, a geologist forsooth, because he had published the fact that the sands of Toronto Island had come by wave action from Scarborough Bluffs, and as a scientific man was worthy to have been a founder of a society honored by the word Royal in its title.

The pitiful position held by many of the municipal engineers is a publicity of the opposite kind that is doing us much harm. On the other hand the good citizen activities of some of our Engineers who are energetic on Civic Guilds and other public committees is of the right kind. To a few it is given to be Presidents and Vice-Presidents of large commercial organizations. Their presence in our Council is good publicity. There are many avenues closed to us however. The Engineer is too direct and too what-shall-I say, to be a successful politician. We study our men but not our fellow man. The settlement of labor troubles comes more and more to the Engineer but we shall not succeed in persuading our fellow man to elect us to office for a long time to come. The study of our fellow man may be the first step to a successful publicity.

Am I stumbling too much in my groping over this idea of publicity. Many of you, especially those who have made your mark and your assured income may say that the last thing you want is publicity. But surely you will agree that the proper kind of publicity, the kind that will educate the public to a better appreciation of the Engineer would be of great help and benefit to those coming in at the gate of the profession, and is not this Society a guardian of all the best interests of those entering the gate as well as a guard against incompetents and wrongdoers. The fact that ordinary methods of publicity offend us is no reason why we should avoid all publicity. The problem that is before us is to find suitable publicity. Without presuming to do other than grope might I suggest that legislation that would compel municipal engineering work to be under the control of Engineers of the rank of members of this Society would be very good public-

ity. The publication of a comprehensive code of ethics might also be good publicity. The expulsion of some of our members might be as good as any other form. Possibly we have not guarded the citadel so carefully but that some have entered who are not fit company for decent men, much less for Engineers.

In our publicity direct attack will not do. We are not good enough as story tellers. It may be true that all that counts for health and prosperity is based on the work of the Engineer; but the story or the picture of our work shows to the public but a pile of wood or a calabash of water—larger or smaller but still the same. We must exhibit the man—we must show that it is not the slave and the imbecile accomplishing only through toil. We are wielders of the weapon and we must show that the wielding calls for all the best there is in man by any count you choose. We must emphasize the man. The weapon has been glorified—the forger of the modern weapon of the Engineer is a trained story teller, the story telling is a part of his training that accompanies his education as a maker of weapons. The modern worker in science not applied is fully one half story teller, and often the scientific half exists primarily for the story telling half. Just as there are many alleged weapons wonderful in their gilt and filigree whose only use is that of adornment, so is much of science polished and attenuated for purposes of exhibition rather than of use.

But published or unpublished, modern science is no wonderful and the story of it is told so well and so often that the forger of this weapon appears on a very much higher plane than the wielder of it. As usual truth is at the bottom of the well and search shows that the reverse is the truth. The man who can choose his weapon—who can see so broadly and so clearly in the complexities of local conditions that he can select the weapon to fit his campaign and then with skill and moral fibre wield the weapon is not less worthy of high place in the community than the maker of weapons, no matter how wonderful or polished they may be.

This simile will offend by its incompleteness and apparent weakness. Is the gun-layer greater than the designer and constructor of the modern 13-inch rifle? The simile seems in error. I use it in an attempt at a broad impression—a parallel to the hewer of wood and drawer of water, not as a definition. The man from Coreze used the club and the stone and won thereby progress for the race—it was the wielding of these weapons that won. The modern weapons developed by science have given man much greater power over nature; but it is still the wielding of these weapons that makes them of benefit.

The doctor and the engineer are the wielders of these modern weapons in the struggle against nature. The gun-layer taking orders from the fire control in order to destroy his fellow man is not a parallel with our man of Coreze.

This wielding of the Engineer is new, is so very new and is growing so rapidly that we have no comprehensive view of it. It is not part of the so-called science, it is not applied science, it is man in action, using the sciences, in the most complex and the most useful action progress has had. If we simply refer to this action as work the mind of the public will follow the old nerve path and associate it with toil, with the slave and the wood and the water. Do we need anything different, do we require the higher approval of our fellow man? Some of us, perhaps, are not interested.

What about our duty to those entering the gate?  
What about our tribal pride?



## THE BALTIC MINING METHOD

The Baltic lode is one of the chief copper deposits in Michigan. While it has not been explored at great depth compared with the Calumet and Hecla and Quincy lodes it is expected to yield several hundred million pounds of copper. Mr. J. R. Finlay in 1911, without allowing for very great depth below the workings estimated the production at 15,000,000 tons ore containing 311,000,000 pounds copper. This estimate will be far exceeded if the deposit persists to such depths as the other great lodes in the district.

The mines on the Baltic lode are the Champion, Baltic and Trimountain. The width varies commonly from 15 ft. to 60 ft. In some places the lode is mined for

through mill holes. The mills are built up with a circular wall of rock, leaving an opening about 4 ft. in diameter. Iron lips are placed at the chute, so that the ore can be drawn off from the flat bottomed mill holes into tramcars.

When walls are built and mill holes started, the remaining space is filled with poor rock. Then stoping is started, the drills being rigged up on the waste. Where the amount of poor rock broken is too small for the filling required, additional rock is broken from the foot or hanging in "poor rock stopes." The ore broken is sorted where it falls. The waste is left to fill in the stope, and the ore is thrown into or car-



View on Twelfth Level, Baltic Lode, Champion Mine, Michigan, Showing Method of Protecting the Levels

a width of 80 or 90 ft. The thickness is in most places greater than 20 ft. and averages about 24 ft.

In all the mines on the Baltic lode, the system of mining adopted is to break the rock for the full width and sort out the poor rock and use it to fill in the stopes.

Shafts are sunk in or near the footwall, and levels are about 100 ft. apart. Drifts are either run 8 ft. x 8 ft. and then cut out the full width of the lode, or else run the full width at once. Then another cut is taken off the back, the drills being mounted on broken ore. There is then an opening 16 ft. high for the width of the lode. The ore is drawn off, and the broken waste rock left in piles in the drift. The levels are now enclosed by "dry" walls built of rock, and a cover of lagging laid on heavy timber caps. Openings are left at intervals in the wall for chutes to draw off ore

ried in small cars to the mill holes. Stoping proceeds in this way, the mill holes being built up and the stope filled with waste while the ore is being drawn off.

When the stope has been carried up to within about 30 ft. of the next level, a so-called caving method is used to remove the arch. A raise is carried up to the level, and numerous holes drilled in the ground on either side of the raise. When the level is no longer needed, a wide opening is made by firing all these holes, and the waste rock filling in the stope above follows the ore down into the stope below. The ore is sorted out and thrown into the millholes and then drills are rigged upon the waste filling in the stope, and slices are taken off the arch. When only a few feet remain a large number of holes are drilled nearly through to



the level, the stope is well cleaned of ore, and then the holes fired. The broken ore falls down into the stope, and is followed by a pile of waste from the stope above. As much of the ore as possible is sorted out and thrown into the mill holes. When all readily reached is sorted out the drills are rigged up on the side of the pile of waste and another cut is made across the lode. Then again the stope is well cleaned of ore, and the last few feet of back is drilled with numerous holes. These are fired, and another cave of waste takes place. In this way all the lode is broken and most of the ore is saved.

#### MR. LINDSEY ADDRESSES STUDENTS.

At its meeting on Nov. 11th the Mining and Metallurgical Club of the University of Toronto, was fortunate enough to have Mr. George G. S. Lindsey, K.C.,

out any visible indication of a mine and whose chief object is to line his own pocket.

Turning to the more prominent mineral productions of Canada, Mr. Lindsey gave figures to show the wide variation in costs and profits and pointed out the need in many cases of care at every turn in order to declare dividends. In the case of iron the profits are very low and have to be supplemented by combining allied industries such as railways, power plants, etc., with that of iron and steel. An interesting fact pointed out was that there is a distinct shrinkage in the demands for iron and steel on account of the fact that our railway construction is reaching its completeness.

In conclusion Mr. Lindsey pointed out that although Canada's mineral resources were vast in extent, the sources of capital for development were equally extensive, and predicted that mining in the future would be



A View on Twelfth Level, Champion Mine, Illustrating Method of Drawing Off Ore from Stopes

President of the Canadian Institute, to address it, his topic being "Canadian Mining, Its Needs and Difficulties."

Mr. Lindsey introduced his subject by showing how much the existence of mining owes to the prospector, but on the other hand, how the profession is being held back by the difficulty of the prospector and the capitalist or engineer in meeting on a common basis concerning the value of the claim. The prospector wants to be paid for enduring loneliness and suffering hardships while searching for the elusive vein, and the mining man wishes some tangible value in return for his purchase price.

The speaker next uttered a warning concerning a certain type of mining broker who floats companies with-

much less "happy-go-lucky" in nature as the prospector's attitude changes, and expressed the hope that mining boards of directors would soon see the advisability of including a technical mining man in their number. As a parting word, the speaker admonished the coming mining engineers to maintain a high standard of integrity and to raise the dignity of the profession by meeting the public in an honest and open manner.

Washington special says England has offered to lift her embargo on various commodities, including wool, in return for a more definite policy on part of United States toward preventing shipment of copper and other contraband to enemies of allies.



# FIRST AID TREATMENT OF INJURED PERSONS

By Magnus W. Alexander.

(Secretary, The Conference Board on Safety and Sanitation.)

Humanitarian as well as economic considerations demand of each employer, and for that matter of every one in his employ, persistent effort for the prevention of accidents and of injuries to persons. To accomplish this purpose is the finest work that can be done in the field of safety and sanitation. It is clear, nevertheless, that absolute immunity from all accidental injuries cannot be expected; it is therefore of next importance to eliminate or promptly check the harmful results of such injuries as do occur, in order that injured persons may not be kept unnecessarily from their daily work or suffer any permanent physical impairment or disfigurement.

Injuries to persons may be due to accidents such as the breaking of a machine or a tool, the spattering of molten metal or the flying of chips, or they may result from unsanitary or injurious conditions such as are caused by smoke or poisonous vapors; persons may suffer temporary disability from physical weakness or from unavoidable conditions of employment, and quite often, inexcusable carelessness of the employee may be the cause of the injury. Whatever the cause, it is obvious that an injured person should receive prompt and effective attention, sometimes to prevent graver consequences such as blood poisoning, and sometimes to save even life itself, as when the injured person bleeds excessively.

If a physician or a professionally trained nurse is close at hand, it is of course safest to turn the injured over to his or her care; in most instances, however, such is not the case. Even where doctors and nurses are regularly employed in industrial plants or are located nearby, they may be engaged upon other equally serious cases or may be temporarily absent when they are urgently needed. Often also the nature of the injury, such as severe bleeding or unconsciousness from electrical shock, demands effective treatment without the waste of a single minute, when the time lost in taking the patient to the doctor or in bringing the doctor to the patient might prove fatal. Then there are the thousands of slight injuries like cuts of the hands or irritations of the eyes, when the injured persons will not take the time nor trouble to go to the dispensary in the plant or to a doctor nearby, but will use unsafe methods of self-treatment, or will secure similarly harmful attention from a co-worker, who is as incompetent as himself to properly attend to the injury. For all of these reasons, it is becoming quite universally agreed that selected persons in employment—usually the superintendent and some foreman, clerks or storekeeper—should be taught proper first aid treatment of injured or sick persons. Where it can readily be done and particularly in large establishments or where there is an unusual risk in the employment, the first aid instruction should be given by a competent physician and should be repeated periodically so as to keep the "First Aid Corps" in good practice.

One strong point that should be impressed on laymen who give first aid treatment to injured persons is that they are not rendering medical service and should not attempt to do so. First aid men are either supplanting in an effective way the slipshod methods of the

person who treats his own slight injuries or those of his fellow men, or they are doing in an intelligent way the necessary preliminary work in more serious cases, pending the arrival of a physician.

Often in order to save the expense of first aid instruction by a physician, but usually to supplement his efforts and to provide some readily available guide as to what should be done in emergency cases, first aid books are placed in the hands of first aid men. These books are sometimes rather voluminous because they go into a very complete description of the nature and character of the various injuries and ailments, point out their manifestations and, aside from giving instructions for their treatment, indulge also in lengthy explanations of the reasons for such treatment.

Bearing in mind the purpose for which first aid instructions are given and that the first aid man should never consider himself or be considered as a substitute for the physician, but rather as his emergency assistant, it would seem the wiser course to eliminate from these instructions every unnecessary word so as to reduce the reading matter and concentrate attention upon the things which should and should not be done. Quick action in emergency cases is of vast importance and no time should be lost in reading irrelevant matter or in searching through many pages of a first aid book. Finally, the instructions should specify the use of simple materials that may be readily available to first aid men and can be used safely and effectively by them. Concise instructions for first aid treatment, readily understandable by the laymen, and calling only for a few commonly used materials, quite harmless in themselves, will, if properly followed, prove of inestimable practical value and eliminate much suffering.

It was with these ends in view that the first aid instructions, accompanying this article, were developed. Groups of physicians who had had large experience in treatment of injured persons in a great variety of employments were called together in conferences for the purpose of agreement upon the best methods for first aid treatment by laymen, and the most effective and necessary medicaments, bandages and instruments to be used in this connection. "There must be one best method of first aid for each kind of injury; such best methods should be agreed upon in order that they may be recommended to industrial managers as a standard practice for treatment of their injured employees." This was the task placed before the physicians, and in addressing themselves to this task they reached tentative conclusions which were given practical tests, on the basis of which final conclusions were agreed upon at a subsequent conference. With these conclusions as a guide, first aid instructions were prepared and submitted to and approved by all physicians participating in the conferences. Other medical practitioners also confirmed the findings.

These instructions are therefore confidently recommended for general use as being practicable and effective directions for the treatment of injured and sick persons by laymen, with least chance of harmful consequences through unnecessary manipulation of the



patient or the application of unsterilized water or the use of injurious medicaments.

Special attention should be given to the training of men in a method of artificial respiration of persons who are asphyxiated by gas, water or smoke or rendered unconscious by electrical shock. Instructions for resuscitation as given in this article follow the Prone Pressure Method which was recommended some years ago by the Commission on Resuscitation, composed of authorized representatives of The American Medical Association, The National Electric Light Association and The American Institute of Electrical Engineers.

If the uncounted thousands of injuries treated by laymen could be analyzed, the high degree of the effectiveness of such treatment would at once astonish and gratify. In quite a few instances, nevertheless, wounds even apparently slight in character which have received careful attention by first aid men have developed serious consequences, because of under-estimation of the real extent of the injury or on account of the contributory cause existing in the impaired physical condition of the patient or for other reasons unknown to the first aid man. If these cases could be located promptly and put under medical care before they develop too far, much would be gained in still further popularizing first aid treatment by laymen. This may be done by adopting a first aid follow-up system which must, of course, be simple and inexpensive in character and practically automatic in its operation. The use of first aid record cards admirably fulfills this function. It is only necessary to provide each first aid man with a supply of these cards and instruct him to fill out one for each injury which he treats and to forward the same promptly to the general office or works dispensary of an industrial establishment or to a responsible person designated for this purpose. The record should include the name of the injured person and a brief record of the injury. The recipient of the record cards is thus afforded the opportunity of knowing exactly, day by day, who among his employees has been injured and the character and extent of their injuries; he is therefore in a position to follow up all injured persons and determine whether subsequent medical attention is needed and in that case furnish the same promptly. This follow-up system is inexpensive and wherever tried has proved very effective.

In some plants it may prove advisable to elaborate the information on the card even to the extent of calling for suggestions for the prevention of the recurrence of the accidental injury, or data may be added that will permit a study of the conditions under which accidental injuries occur most frequently. In general the simpler the card, the more surely will it be used properly.

First aid treatment of injured persons by laymen without any subsequent checking of the work may give rise to justified criticism; coupled with an effective, quick-acting follow-up system such treatment will be found efficacious in large employments as well as in small.

#### INSTRUCTIONS TO LAYMEN FOR FIRST AID TREATMENT OF COMMON INJURIES AND DISORDERS.

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##### Wounds That Bleed.

**Abrasions, Cuts, Punctures.**—Drop 3 per cent. alcoholic iodine into wound freely, then apply dry sterile

gauze to wound and bandage it. Do not otherwise cleanse wound.

**Severe Bleeding.**—Place patient at rest and elevate injured part. Apply sterile gauze pad large enough to allow pressure upon, above and below wound. Bandage tightly.

If severe bleeding continues apply tourniquet between wound and heart and secure doctor's services at once. Use tourniquet with caution and only after other means have failed to stop bleeding.

**Nose Bleeding.**—Maintain patient in upright position with arms elevated. Have him breathe gently through mouth and not blow nose. If bleeding continues freely press finger firmly on patient's upper lip close to nose or have him snuff diluted white wine vinegar into nose.

##### Injuries Which Do Not Bleed.

**Bruises and Sprains.**—Cover injury with several layers of sterile gauze or cotton, then bandage tightly. Application of heat or cold may help, other means are unnecessary. If injury is severe place patient at rest and elevate injured part until doctor's services are secured.

**Eye Injuries (except eye burns).**—For ordinary eye irritations flood eye with 4 per cent. boric acid solution. Remove only loose particles which can be brushed off gently with absorbent cotton wrapped around end of toothpick or match.

Do not remove foreign bodies stuck in the eye. In that case and for other eye injuries drop castor oil freely into eye, apply sterile gauze, bandage loosely and send patient to doctor.

**Splinters or Slivers Embedded in Skin (except in eyes).**—If easily reached withdraw with tweezers, then treat same as "Wounds that Bleed;" otherwise let doctor attend to it.

**Fire Burns, Electrical Burns and Sunburn.**—Do not open blisters. Use burn ointment (3 per cent. bicarbonate of soda in petrolatum) freely on sterile gauze applied directly to burn. Cover with several thicknesses of flannel or other soft material, then bandage, but not tightly.

**Acid Burns.**—Thoroughly flush wound with water, then dry wound, apply burn ointment and bandage as above.

**Alkaline Burns.**—Thoroughly flush wound with water then flood with white wine vinegar to neutralize (dilute vinegar for alkaline eye burns), dry wound, apply burn ointment and bandage as above.

**Eye Burns.**—Treat in the same manner as other burns.

**Dislocations.**—In case of dislocation of finger except second joint of thumb, grasp finger firmly and pull it gently to replace joint, then place finger in splint and bandage it. In all other cases place dislocated part at rest and promptly secure doctor's services.

**Fractures.**—Make patient comfortable and secure doctor's services at once. Avoid unnecessary handling to prevent sharp edges of broken bones tearing artery. If patient must be moved place broken limb in as comfortable position as possible and secure it by splint.

In case of severe bleeding apply sterile gauze and follow directions under "Severe Bleeding."

**Dizziness, Headache, Nausea.**—Give patient teaspoonful of aromatic spirit of ammonia in hot or cold water.

**Chills and Cramps.**—Give patient 20 to 30 drops of Jamaica ginger in hot or cold water. If improvement is not speedily obtained send for doctor.



**Frost Bites.**—Rub with ice, snow or cold water, then treat as "Fire Burns."

**Insect Bites.**—Treat as "Wounds that Bleed."

**Internal Poisoning.**—Immediately secure doctor's services. Make patient drink large quantities of water, preferably warm, and make him vomit by sticking one's finger down his throat or by other means.

**Heat Prostration.**—Give patient teaspoonful of aromatic spirit of ammonia in hot or cold water. In case body feels warm apply cold to it; if necessary give cold bath. In case body feels cold and clammy, apply heat to it and immediately send for doctor.

**Unconsciousness from Fainting.**—Lay patient on his belly and turn his face to one side. Loosen all tight clothing. Remove false teeth, tobacco, etc., from mouth. Apply cold to head, warmth to hands and feet. If breathing stops treat patient as directed under "Electric Shock." Give no liquids by mouth until patient is fully conscious. Then give teaspoonful of aromatic spirit of ammonia in hot or cold water.

**Shock, Following Injury.**—In case shock is due to severe bleeding, control it first as directed under "Severe Bleeding," and summon a doctor.

Lay patient flat on back and keep him warm with blankets, hot water bottles, etc., and provide plenty of fresh air. Let patient inhale fumes of aromatic spirit of ammonia. If fully conscious give patient hot drink or teaspoonful of aromatic spirit of ammonia in hot or cold water.

**Unconsciousness from Asphyxiation by Gas, Smoke or Water.**—Treat patient as directed under "Electric Shock."

**Electric Shock.**—Immediately free patient from electrical circuit using every care to protect one's self against electric shock. Then if patient is unconscious, even if he appears dead, lay him on his belly with arms extended forward, turn his face to one side, remove false teeth, tobacco, etc., from his mouth and draw his tongue forward.

Kneel, straddling patient's thighs, facing his head, and resting your hands on his lowest ribs. Swing forward and gradually bring weight of your body upon your hands and thus upon patient's back, then immediately remove pressure by swinging backward. Repeat this movement about twelve times per minute without interruption for hours if necessary, until natural breathing has been started and maintained.

Meanwhile send for a doctor, have patient's tight clothing loosened, keep him warm and provide plenty of fresh air. Do not give patient liquids by mouth until he is fully conscious.

### ALASKA GOLD.

It is estimated by A. H. Brooks, of the United States Geological Survey, that the total output of gold lode mines of Alaska, from earliest mining in 1882 to the end of 1913, has been \$62,626,113, and that since mining began in 1880 the Alaska placers have produced \$165,480,848. The total output of silver from auriferous lode mines has been 1,096,336 fine ounces and from placers, 1,710,503 fine ounces.

The gold production of Alaska in 1913 was \$15,626,813, against \$17,145,951 in 1912. The yield from siliceous ores was \$4,814,813, against \$5,002,399 in 1912, and that from copper ores was \$132,000, against \$153,552 in 1912. The remainder of the output was from placers and amounted to \$10,680,000 in 1913, against \$11,990,000 in 1912, and \$12,540,000 in 1911.

## THE RHYMES OF THE RE-SURVEY

By R. Sidney Bartram in Applied Science.

(With apologies to Robert W. Service.)

### PART I.

Now this is the tale of the labors performed by a survey gang

Away in the back of the wild lands, where nobody cares a hang;

Where the brown bear prowls in the thicket, and the screech owl splits the night,

And skunks and other blossoms sweet, yield scents of rare delight.

When grey the dawn is breaking, your duties are begun,

Throughout the hours of daylight you labor with the sun;

And when the shadows lengthen, and the stars are shining bright,

You take a shot at the polar star in the middle of the night.

You sleep in a dis-used box car, on a bed of boughs of spruce,

But there's nothing to get by kicking, so what in hell's the use?

You dine on pork and cabbage, on pork and beans you sup,

And there's pork next day for a breakfast dish, to clear the remnants up.

You pump a rusty handcar for seven miles down the track,

And the sweat runs into your eyebrows, and you long to ease your back.

With picket, chain and transit, you run the traverse through

For seven miles, or maybe ten; as much as you can do.

You sit on a rotting deadfall, and open a can of pork,

And eat a hasty dinner, with fingers for a fork;

Then on you go with the traverse, as hard as you can push,

Till the shades of night are falling fast, o'er swamp and track and bush.

And then you hurry homeward, to the supper waiting there,

And think of your lowsy spruce-bunk, and the sleep that knows no care;

But, swinging round a rock-cut, you "make a meet" with a freight,

And "Safety First" is a maxim sound, so you leave the car to its fate.

The car is smashed to splinters, which pleases the engineer,

While you stand and swear in chorus, but only the night winds hear,

So you shoulder the blasted transit, the picket, axe and chain,

And start to tramp it homewards, a dozen miles in the rain.

At last, when the stars are shining, and the moon is swinging low,

You reach the cars on the siding, foot-sore and full of woe;



You kick while you eat your supper, you growl when  
you go to bed,  
And curse all night at the chap who snores, and wish  
that you were dead.

But somehow, in the morning, you wake as fresh as  
paint,  
Although last night you thought the life would de-  
moralize a saint;  
And you gather the junk together, and out on the line  
you go,  
For another day's hard labor, in rain, or sun, or snow.

But to-day is not track traverse, it's Township lines in  
the bush,

And your axe bites deep of the cedar, and down she  
comes with a rush.

You splash your way through the muskeg, you flounder  
across the creek,

And flies and "skeeters" drink their fill till you  
feel too mad to speak.

But it's not bad work in the summer, it's rather fine in  
the fall,

But in the good old winter it's the greatest job of all;  
With frozen ears and fingers, and nose that you cannot  
feel,

You laugh aloud with your stiffened lips, for you're  
doing the work that's real.

And so it was in the Beginning, and so it is to-day,  
And so shall it be to the end of things, when you are  
taken away;

Until you are made into Angels, with transit, and tape  
and chain,

You will work for the darned old C.P.R., World with-  
out End,

Amen.

## PART II.

### "The Next World."

Now this is the fate of surveyors, who love their beer  
too well,

They must do their work in Hades, surveying the  
bounds of hell;

They must blaze their trail through the darkness, they  
must run the Line of Regret,

Till the Hubs of Hell are planted well, and the Devil's  
Corners set.

And this is the fate of the Draughtsman, a red hot com-  
pass and pen,

And a red hot draughting table, for ever and ever.  
Amen.

He must draw the Thing as he sees It, with a Flag on  
every Hub,

Till a white hot print of the Bounds of Hell is passed  
by Baalzebub.

And the Picketmen and Chainmen must set a witness  
stake,

Well squared and truly numbered, in the midst of  
the Burning Lake

They must drag the chain forever, and measure every  
lot

Through bush that burns but never wastes, and  
swamp that's always hot.

And the Cook who cooked their dinner, oh! what shall  
be his fate

Shall he stand beside the furnace door, and fill a  
fiery plate?

Oh no, he shall stand in the corner, away from the  
furnace heat.

He had it hot in the cook car, so now he shall cool  
his feet.

For surveyors and all their outfit are sinners beyond  
recall,

They hold no law but the law of might, which gives  
to the mightiest all.

So he who has learned his lesson, who has served his  
year and a day

May sin to the full of his heart's content, and none  
shall say him "Nay."

But the Devil stands in the Gates of Hell, to see who  
each may be,

When an O. L. S. is sighted, he rubs his hands with  
glee,

He calls aloud to his stokers, "Ha, stoke the furnace  
well,

Here's another surveyor coming along, we must make  
him hot in hell!"

## SEPARATION OF COPPER FROM NICKEL

In a paper to be presented at the February, 1915,  
meeting of the American Institute of Mining En-  
gineers, Mr. Boyd Dudley, Jr., describes results of  
study of the reactions that have been considered as  
part of the mechanism of the chloridizing roast and of  
the conditions under which nickel oxide and copper  
oxide may be chloridized.

The study of the chloridation of the oxides of nickel  
and copper was undertaken in order to determine the  
conditions most favorable for the chloridation of each,  
and thus to demonstrate whether or not a separation  
of these metals can be effected by the use of the chlori-  
dizing roast. In particular would such a process be  
useful in treating heavy pyritic ores containing copper  
and nickel. Such ores occur at Sudbury, Ontario, and  
are there treated by heap roasting followed by partial  
pyritic smelting for copper-nickel matte. The matte  
thus produced is concentrated in a basic converter to  
a matte containing 80 per cent. of combined nickel and  
copper with less than 1 per cent. of iron. The con-  
verter slag is resmelted in reverberatory furnaces. By  
this method of treatment all of the iron of the ore  
enters the waste slags of the furnaces and is therefore  
lost. If the copper can be removed from such ores and  
the iron and nickel left in a residue of such character  
as to be suited to blast-furnace smelting for nickel-  
bearing iron, the iron would be saved and the value  
of the ore would be correspondingly increased. In ad-  
dition to saving the iron, there is of course the possi-  
bility of utilizing the sulphur for the manufacture of  
sulphuric acid, where such utilization is warranted by  
local conditions and markets.

In the experiments performed by Mr. Dudley, mix-  
tures of copper oxide and nickel oxide with ferric  
oxide, silica, ferric sulphate, and sodium chloride were  
subjected to heatings at various temperatures and for  
different times in an electric tube furnace, a current of  
dry air being passed over the mixture during the  
heating.

Mixture No. 1 contained double the amounts of  
ferric sulphate and sodium chloride necessary to con-  
vert all of the copper into cupric chloride. Mixture  
No. 2 contained double the amounts of these ingre-  
dients necessary to convert all of the nickel into chlor-



ide. Mixture No. 3 contained enough ferric sulphate and sodium chloride to chloridize both the nickel and the copper.

During the first 10 minutes of heating, chlorine and sulphur trioxide were evolved freely. After this length of time the rate of evolution of these gases usually diminished perceptibly, and continued to diminish until at the end of 4 hours the air coming from the tube contained only small amounts of them. The time of heating was in most cases 4 hours; in a few it was only 2 hours.

Mr. Dudley, in reviewing the results of the experiments, says: "It is necessary to keep in mind the facts, that only small amounts of material were used, that the time of treatment in each case was comparatively short, and that the results cannot be directly compared with those secured when a chloridizing roast is performed on a large scale because of the differences in the conditions. It was the intention to study the behavior of copper oxide and nickel oxide when mixed with iron oxide and subjected to heating under the conditions that favor the chloridation of the metals. It is necessary to consider as chloridized that part of the copper and nickel which was volatilized, because neither the sulphates nor the oxides of these metals are volatile under the conditions existing in the experiments.

"The experiments with mixture No. 1 show that the completeness of chloridation of the copper increases with increasing temperature and with increasing time. An interesting point is the fact that in the last experiment with this mixture 92.5 per cent. of the copper was recovered from the volatile product. Experiments with mixture No. 2 containing nickel oxide show the behavior of the nickel under conditions similar to those to which the copper oxide was subjected. Only traces of nickel were found in the volatile products. The maximum production of water-soluble nickel resulted at 550 degs. C., the nickel thus extracted amounting to 17.7 per cent. The experiments at higher temperatures showed decreasing amounts of water-soluble nickel. Roasting for 4 hours at 700 degs. C. produced only 0.8 per cent. of water-soluble nickel. Whether or not the nickel extracted in these experiments was in the form of chloride or sulphate was not determined; the conditions were favorable for the production of either compound.

"Considering the results of these two series of experiments, it appears that nickel is not rendered water soluble nor is it volatilized to any considerable extent when the temperature of the roast is above 650 degs. C., while such temperatures are quite favorable to the chloridation of copper. In confirmation of this conclusion the third series of experiments show a maximum of 3.3 per cent. of the nickel converted into water-soluble and volatile compounds at 650 degs. C. The increased tendency toward volatilization exhibited by the nickel in the presence of copper is probably due to the more or less mechanical influence exerted on the nickel chloride by the volatilization of the copper chloride.

"These laboratory experiments of course do not prove that roasted pyritic ores containing copper and nickel can be treated commercially by chloridizing the copper and leaching it from the iron and nickel oxides, leaving a product suitable to be smelted to nickel-bearing pig iron. That could only be demonstrated by carefully conducted experiments on large quantities of the ore in question. However, the experiments do prove the possibility of effecting such a separation and indicate the temperatures at which the roast should be conducted in order to secure the desired results."

## GEOLOGY ALONG YUKON-ALASKA BOUNDARY

Some time ago Dr. D. D. Cairnes, of the Geological Survey of Canada, presented before the Geological Society of America, a paper entitled "Geological Section Along the Yukon-Alaska Boundary Line Between Yukon and Porcupine Rivers." Early in the current year this paper was published in that society's Bulletin, and recently it was reprinted in pamphlet form. Dr. Cairnes has done much geological work in Yukon Territory and other parts of the Canadian Northwest during the last ten or fifteen years so has very much more than a superficial knowledge of that country. During the field-work seasons of 1911 and 1912 he was employed mapping and studying the geology along the 141st meridian (the Yukon-Alaska International Boundary) between Porcupine and Yukon rivers, or between latitudes 67 deg., 25 min. and 64 deg., 40 min., a distance of 191 miles. This work, he explains in the introduction to his paper, was performed on behalf of the Canadian Geological Survey, and was extended for two or three miles on each side of the boundary line, an agreement having been entered into between the Geological Surveys of the United States and Canada whereby geological work was conducted on both sides of the 141st meridian to the north of the Porcupine, by members of the United States Geological Survey, in exchange for similar work by the Canadian Geological Survey, to the south of that river.

Dr. Cairnes continues: "The belt to the south of the Porcupine river proved to be of particular interest and stratigraphic importance, as all the Paleozoic systems from the Cambrian to the Carboniferous are represented and nowhere else in the entire Rocky Mountain region of Canada and the United States is so complete a section of the Paleozoic known within so limited an area. A considerable collection of fossils was obtained, which includes, in addition to the Cambrian faunas, many other interesting varieties, including graptolites, which are of rare occurrence in Alaska and Yukon."

No previous geological work had been performed along the 141st meridian between the Porcupine and Yukon, except in the immediate vicinity of those rivers. McConnell, of the Canadian Geological Survey, came down the Porcupine river in 1888, making a geological reconnaissance en route, and Kindle made a geological examination of the rock formations along the Porcupine below New Rampart House for the United States Geological Survey during the summer of 1907. In addition a number of geologists, including McConnell, Spurr, Prindle, Brooks and Kindle, and others have reported on the geological formations along Yukon river in the vicinity of the International Boundary. With these exceptions, practically nothing was known geologically concerning the area in which Dr. Cairnes was engaged during the summers of 1911 and 1912, previous to the commencement of his work in the former year.

Topographically, the area or belt along the 141st meridian between Yukon and Porcupine rivers lies for greater part, at least, within the Yukon Plateau province; and since this physiographic terrane in the vicinity of the 141st meridian has a general westerly trend, it is cross-cut by the meridian practically at right angles. Thus in going from New Rampart on the Porcupine, south to Yukon river, the line of travel is transverse to the trend of the main topographic features of the district, and consequently a considerable diversity of topography is encountered.



In certain localities where the prevailing bedrock is limestone or dolomite, the plateau characteristics are still well preserved, and extensive tracts of upland occur having elevations of 3,000 ft., or more, above sea-level. With the exception of these areas, the original plateau surface has been almost, or entirely, destroyed, and throughout the greater part of the district the land surface has become thoroughly dissected.

Two ranges or mountain groups are crossed by the boundary line, which mountains have summits rising to elevations exceeding 5,000 ft. above sea-level, and it is possible that one or both of these may be connected with the Rocky Mountain system to the west, and thus constitute outlying lobes of that physiographic terrane. It is more probable, however, that these are but isolated mountainous areas included within the Yukon plateau. To the north and south of these more rugged and mountainous areas, as well as between them, the topography consists dominantly of well-rounded, irregularly-distributed hills, and at frequent intervals throughout the district westerly flowing streams are encountered which have, in most places deep, steep-walled valleys, the floors of which are as much as five miles in width and from 900 to 1,200 ft. in elevation above the sea. Nowhere was any evidence of glaciation noted.

**General Geology.**—The information given by Dr. Cairnes relative to the General Geology of the region under review cannot be reprinted here, for it comprises twenty pages of the Bulletin. It is dealt with first in a general statement, followed by a table of formations, and then under the following sub-heads, respectively: Metamorphic Rocks, Dominantly Sedimentary Rocks, and Igneous Rocks. Under the first of these come the pre-Cambrian (?)—Yukon Group. The second lot includes the Lower Cambrian or pre-Cambrian—Tindir group. Devon-Cambrian limestones and dolomites, Devon-Ordovician shale—chert series, Carboniferous, Permo-Carboniferous (?) conglomerate, Mesozoic-Pennsylvanian—Orange group, and Quaternary—superficial deposits.

**Summary and Conclusions.**—Dr. Cairnes closed his paper as follows: "A very complete and interesting section of the Paleozoic has been found to occur along this portion of the Yukon-Alaska boundary, which adds considerably, both stratigraphically and lithologically, to our knowledge of this era in the north-western portion of the continent. One of the most important results of this work along the boundary is the finding of the great thicknesses of limestones and dolomites which there occur. These beds range in age from Carboniferous down to the Middle and possibly also include the Lower Cambrian, showing that the deep sea reigned, apparently continuously, over extensive portions of the region during this tremendous period of time. Another very interesting conclusion concerns the rapidity with which it has been shown that the lithology changes, and consequently how uncertain and unsatisfactory lithological evidence has proved to be, thus adding greatly to the difficulties connected with geological mapping in that region. Toward the southern end of the section, where a limestone and a shale group are well developed, at one point the limestone group persists upward from Middle Cambrian to Lower Devonian, and is overlain by the shale group, which contains a fauna ranging in age from Upper Ordovician to Carboniferous.

"In addition, a certain amount of light has been thrown on the age of the older schistose rocks of the

region. Heretofore these rocks, which have been generally considered to constitute the oldest geological terrane in each district in which they have been studied, were accordingly variously classed as pre-Devonian, pre-Silurian, or pre-Ordovician, according to the age or supposed age of the oldest overlying sediments. It would now appear that this schistose complex of the Upper Yukon basin is at least pre-Middle Cambrian and is in all probability of pre-Cambrian age. This information is of more than ordinary significance, since these rocks are so extensively developed, and since from them has been derived a great portion, at least, of the placer gold of the Yukon and Alaska."

Dr. Cairnes says, in conclusion, that the geological work done along the 141st meridian, as a result of which his paper was prepared, was necessarily performed very rapidly, owing to the difficulties of access to the district. As a consequence, the information obtained concerning many points is very incomplete, and numerous interesting problems which might otherwise have been solved still remain unsettled; in fact, the whole work was that of the pioneer. It is hoped, though, that the knowledge gained will be of some slight assistance in the advancement of geological research in the Northland.

The pamphlet is illustrated by a number of reproductions of photographs and a small locality map, which together add to its value.

### THIRTEEN-CENT COPPER.

Boston, Dec. 8.—Thirteen-cent copper for delivery during the first quarter of 1915 comes on top of a persistent advance in the metal extending over three weeks.

During the past week consumers have been confronted with a puzzling situation caused by the varying prices at which the metal was held, depending upon delivery required.

It is understood that for December shipment electrolytic may be obtained at 12 $\frac{3}{8}$  cents; for January at 12 $\frac{7}{8}$  cents, while 13 cents is named for February and beyond.

The American Smelting & Refining Co. has been virtually out of the market for the past week, as it would do no business below 13 cents. This indicated to the trade a well sold up position. Amalgamated Copper Co. has been willing to do business at a lower figure and on Tuesday effected some sales at 12 $\frac{7}{8}$  cents, before naming the new top figure. Its London price at the same time was up to £60, the ordinary equivalent of 13 cents, but which under existing conditions was regarded as having a parity nearer 12 $\frac{3}{4}$  cents.

### CANADIAN KLONDIKE.

A telegram dated Nov. 18, from the Yukon to the New York office of the Granville Co., states that on Nov. 14 a clean-up of 923 oz. was made, representing two days' digging and general clean-up of dredge No. 1. The telegram continues as follows: "Other boats down account no power; water now coming north fork. Started dredge 4 17th November; dredge 1 shut down for season 17th November. Will endeavor to start dredge 3 18th November. Having great difficulty dredge 2 account ice accumulation during past week, with no power for working. Have every hope raising dredge 2 shortly. Boat apparently only slightly damaged."



## BENEFICIAL RESULTS OF THE WORK OF THE UNITED STATES BUREAU OF MINES

The U. S. Bureau of Mines, established in July, 1910, has become by its work a very important factor in the mining industry. The chief work of the bureau during the four years since its establishment, has been the investigation of problems having to do with the causes and prevention of coal-mine explosions and the safeguarding of the lives of coal miners. In addition, work has been done on the testing of coal and other mineral fuels belonging to or for use of the Government of the United States. During the fiscal year just ended investigations were undertaken looking to greater safety and the prevention of waste in the metal-mining and miscellaneous mineral industries of the country. Recently a small amount of work has been done in an examination of several oil and gas fields of the country with a view to eliminating the large waste of natural gas in these fields. The need of such investigations may be plainly seen when it is understood that so large a part of this waste is easily preventable, that the supplies of natural gas are limited, and that the gas wasted yearly may be fairly valued at not less than \$50,000,000.

The report, just published, of the Director of the U. S. Bureau of Mines, Joseph A. Holmes, describes the work of the Bureau. The following extracts indicate what has been accomplished.

Probably the most notable accomplishment of the Bureau of Mines has been the developing of the movement for greater safety and better health conditions in the mining, metallurgical, and other mineral industries of the country and the gaining of the co-operation of all possible agencies in behalf of this movement.

All the co-operating agencies are entitled to share the credit for the resulting benefits. It is not possible to determine exactly how much credit should be given the Bureau of Mines which has been in existence only a few years, nor can a money value be put on all that it has done. The scientific determination of the physical and chemical factors involved in processes or methods and the routine work incident to the many phases of the mining industry may be so intermingled with the general progress of the industry itself as to render segregation impossible. Moreover, the saving of human life is not a work the value of which can be measured in dollars.

In conducting its campaign for the increase of safety and efficiency in the mining industries there has been adopted the following general plan of co-operation between the National Government and other larger agencies. (1) That the National Government conduct the necessary general inquiries and investigations in relation to mining industries and disseminate in such manner as may prove most effective the information obtained and the conclusions reached; (2) that each State enact needed legislation and make ample provision for the proper inspection of mining operations within its borders; (3) that the mine owners introduce improvements with a view to increasing safety and reducing waste of resources as rapidly as the practicability of such improvements is demonstrated; and (4) that the miners and mine managers co-operate both in making and in enforcing safety rules and regulations as rapidly as these are shown to be practicable. The States, the miners and mine owners, and other agen-

cies, such as the mining and engineering societies, are now showing a commendable willingness to co-operate with the National Government in this work.

During the last fiscal year Bureau of Mines rescue crews were responsible for saving the lives of 7 miners; in the same time, 63 rescues were made by miners and others not connected with the bureau. The training of these rescuers, for the most part, was started by the bureau and continued by the operators, or, in some cases, by the miners themselves.

That the mine-rescue and first-aid training and demonstration work of the bureau is resulting in good is beyond question. Many reports have been received of the beneficial results of first-aid training, not only as an object lesson in the prevention of accidents but in decidedly lessening infection of wounds and death after accidents. While this first-aid training is part of the educational work of the bureau, the fact is clearly recognized that other organizations are engaged in similar work, and that the work is being extended by the recipients of the training.

The furtherance of the work of betterment is in the hands of the leaders in the mining industry. To them, and to State officials, various organizations and societies, and to the miner himself, great credit is due for what progress has been made in rendering mining safer and less wasteful.

### **The Nature and Prevention of Coal-Dust Explosions.**

When the U. S. Congress first authorized an investigation of the causes of mine explosions few people in that country believed that coal dust alone could spread an explosion throughout a mine. Now, that the explosiveness of coal dust has been demonstrated by the bureau, through work in the laboratory, in the field, and in the experimental mine, the bureau's efforts are being directed toward the devising of effective and practical methods of preventing or arresting explosions. Through the development of rock-dust barriers and other devices, as described in another part of this report, the intensity of future coal-mine explosions will most certainly be decreased.

A careful study has been made of the inflammability of coal dust collected from hundreds of mines in different coal fields; a systematic investigation has been made of the possibility of coal-mine explosions starting from the improper use of explosives or the use of improper explosives, or from electric sparks, miners' lamps, mine fires, or other agencies; and various tentative conclusions and proposed recommendations regarding proper precautions are now being tested on a practical scale in the experimental coal mine 12 miles south of Pittsburgh. Through the lack of such an experimental mine properly equipped the progress of the work was delayed for several years; but during the past year the experiments in this mine have given promise of the early development of thoroughly practical preventive devices.

### **Improvement of Mining Explosives.**

In connection with its investigation of explosives the bureau has brought about what is little short of a revolution through the introduction of new types of low-temperature, quick-flame powders, designated as "permissible explosives," of which, during the past



year, more than 25,000,000 pounds was used in the more dangerous coal mines of the United States. Metal-mining explosives should be investigated thoroughly. As indicating the efficacy of certain of these investigations of explosives, the president of the company operating one of the largest metal mines in America recently stated in a public address that the results of the bureau's explosives work, incomplete as it was, had brought about an actual saving to his company in this one mine (the Treadwell mine, Alaska) of \$80,000 yearly.

#### **Development of Mine-Rescue and First-Aid Methods.**

The bureau, with the co-operation of miners and mine operators, has developed its mine-rescue and first-aid work into an agency for aiding the rescue of miners imprisoned by mine disaster, for training miners in rescue methods and in first aid to the injured, and in advancing the general movement toward greater safety in all branches of mining. It is in this work that the bureau has recorded its most notable achievements. Nearly 100 men have been rescued from mines by employees of the bureau and a much larger number have been rescued by men who had received the bureau's training. Rescue and first-aid organizations have been established at many mines and more than 1,200 sets of rescue apparatus have been purchased by mine owners. The bureau itself now has eight mine-rescue cars traveling through the different mining districts in order to give instructions to miners in rescue, first aid, and safety methods. The bureau also has five mine-rescue stations in different coal fields from which it is carrying on similar work. Legislation now pending in Congress will, if enacted, provide for needed increase of equipment and personnel and permit the continuous operation of cars throughout the year. Not the least of the benefits resulting from the work of the mine-rescue cars and stations is the promotion of good citizenship among miners through the demonstration of the Government's interest in their welfare.

#### **The Use of Electricity in Mines.**

Through the activity of the bureau in calling attention to dangers heretofore unappreciated, in the use of electrical machinery in mines, manufacturers have devised safer types of apparatus and States have enacted stricter laws governing electric installations. An investigation of electric lamps for miners has resulted in greatly improving the types now offered for sale.

#### **Other Mine-Safety Investigations.**

During the year the bureau began on a small scale to make investigations looking to the reduction of accidents caused by falls of roof and by caving in mines, by the lack or the improper use of safety appliances in mining and metallurgical plants, by the use of improperly installed electrical apparatus in mines and mills, and by the use of improper explosives and the improper use of explosives in metal mines, quarries, and tunnels. The humanitarian motives for undertaking such investigations are obvious. A sufficient economic reason is that during the past year more than 3,000 men were killed and more than 100,000 were injured in the mining and metallurgical industries of the United States. One-half of these fatalities and three-fourths of the injuries may be regarded as easily preventable. The money loss from the accidents may be estimated at not less than \$12,000,000 a year, and this loss must be ultimately paid by the consumers of mineral products throughout the country.

#### **Mineral Waste Investigations.**

The investigations relating to mineral waste which were begun much later than those relating to safety in mines, have been confined to certain general inquiries and to specific investigations dealing with such topics as the waste from smelters and other metallurgical plants, the waste in the treatment of rare minerals and metals, and the waste in the mining and utilization of coal.

A preliminary inquiry as to the coking of coal in beehive ovens has shown that the total value of the by-products annually lost in the United States through the use of such ovens amounts to \$75,000,000. Although the desirability of developing by-product industries has been recognized, such development has now become an actual need, and the bureau is preparing for publication a report on the progress already made in utilizing the by-products of coke making.

The bureau has also ascertained that the annual waste of metals in brass-furnace practice amounts to over \$4,500,000, and has issued a report showing how this waste can be largely prevented by practical means.

By an expenditure of less than \$15,000 during the past 18 months there has been brought about a saving of natural gas worth not less than \$15,000,000, a sum many times greater than the total cost of all the work done by the bureau during the four years of its existence.

Chemists and engineers of the bureau have demonstrated that a process they have devised for the extraction of radium from its ores can be successfully used on a large scale and will prove more efficient than that used by the largest foreign producers of radium. Through this process it is possible that the cost of radium to the consumer will be reduced to one-third of the present price. The process is to be patented and dedicated to the public.

Other investigations dealing with mineral waste are already demonstrating the possibility of effecting on a commercial scale and without undue cost decided savings in the utilization of various minerals and metals. The need of such investigations should be obvious to anyone who remembers that there is but one supply, and that unreplaceable, of these resources, and that the total wastes or losses in mining and utilizing our mineral resources now amount to more than \$1,000,000 a day.

#### **Fuel Investigations.**

In regard to the fuel investigations of the U. S. Government, these until recently have been largely limited to coal. The bureau has developed methods upon which the Government now purchases its fuel supply and has effected savings in the fuel expenditure of the Government that far exceed the total annual cost of the work. In 1914 the value of the coal purchased by the U. S. Government under specifications prepared by the Bureau of Mines or under the advice of the bureau was more than \$8,000,000. In the same year, as a result of the selection of fuels best adapted to particular heating or power plants, and the constant checking, through the use of samples, of the quality of the coal delivered, the saving to the Government was \$200,000 as compared with the prices paid in previous years. Moreover, the beneficial results of the purchase of coal under specifications have been perceived by many cities, and the savings reported by them last year amounted to thousands of dollars.



A further result of the bureau's fuel investigations is the compilation of a series of comparable analyses of the coals found in different parts of the United States, which are of the greatest value to Government engineers and purchasing agents and to all large users of coal.

The results of other fuel investigations published by the bureau have served as a basis for improving boilers such as are used to heat public buildings and for the development of a new type of power-plant boilers. Moreover, these investigations have stimulated the development of more efficient gas producers. Investigations of house-heating equipment adapted to the needs of Army posts, naval stations, and public buildings under the Treasury Department throughout the country are developing results that must prove of great value to the heating of private buildings.

### COAL AT TULAMEEN, BRITISH COLUMBIA.

Three or four years ago the Columbia Coal and Coke Co., an organization in which Winnipeg, Manitoba, men were largely interested, undertook to open coal measures occurring in the neighborhood of Tulameen river, between Granite creek and Collins gulch. Prior to this company obtaining possession of the property, much prospecting had been done by a British syndicate, under option of purchase, and some good coal had been opened high up the hill on the north fork of Granite Creek. The company, however, did most of its development work from the Tulameen river side of the property, starting a crosscut adit at 710 ft. above the Coalmont townsite, situated in the Tulameen valley and owned by the company. This adit was driven 2300 ft. and it cut a 16-ft. coal seam at 1,900 ft. from the portal; levels were driven on this seam, to the east for 400 ft. and to the west for 850 ft. In 1912 work was concentrated on the west side of the adit; it consisted chiefly of driving main and counter gangways with crosscuts, but great trouble was experienced in keeping the roadways open. Prospecting was also done at what was known as the "Bear's Den," situated about 3,500 ft. northwest of the main adit and at an elevation 1,000 ft. higher; here the No. 1 drift was driven 250 ft. on No. 3 seam, while a crosscut from this working cut No. 2 seam at 150 ft., and the latter seam was opened for a distance of 100 ft. However, coal was not produced on a commercial scale, and in the spring of 1913 operations were suspended.

Late in 1913 control of the property was secured by a Vancouver, B.C., syndicate, and in November work was resumed. An official report for the year includes the following: "The work so far has been confined to exploration on the north fork of Granite creek, and principally in what are termed Nos. 2 and 4 tunnels. The No. 2 tunnel, which had previously been driven a distance of 820 ft. on a seam of coal and shale-bands about 60 ft. thick, was extended another 50 ft., and crosscuts driven to both walls for the purpose of taking samples to demonstrate the quality of the coal. No. 4 tunnel, previously driven 210 ft., was extended another 40 ft., and a similar procedure followed as in No. 2."

Little information had been made public during the current year as to progress made, though it was understood that operations were only on a small scale. However, there now appears to be reason to look for an early improvement in the local situation, judging by the following account published in the Hedley Gazette of November 26:

"A most gratifying strike was made at the Coalmont mine a few days ago when, in the course of development a newly-driven tunnel entered a seam of coal, lying in an excellent position for working, with a good floor and roof. The quality of the coal is finer than that of any encountered hitherto. It is of a high grade and has very little rock mixed with it. Though expected by all in the community, this latest development is a source of quiet satisfaction to all who have interests at stake in the town or mine.

"Considerable activity is noticeable in the office department and it is stated that a prospectus is being prepared with a view to raising money to place the mine on a substantial shipping basis. The question of getting the coal from the mine to the shipping point has been settled. For a time it was undecided as to whether an aerial tramway or a surface tramway would provide the best means for bringing the coal down. In the former case two overhead cables would have to be strung over the top of the mountain and straight down to a point whence a connection could be made with the Great Northern railway across the Tulameen river at Coalmont. A right-of-way for the aerial tramway was begun in the autumn and completed quite recently; but now it is understood that this project will be abandoned in favor of a surface tramway, which is to be built through "The Gap" near where the present wagon-road leads to the mine. This decision is doubly satisfactory, since it suggests operations on a large scale, the great objection to the aerial tramway being that it would not be equal to handling a large output of coal. It would also seem to indicate that sufficient capital is actually in sight to put the more expensive project through.

"After all its ups and downs Coalmont bids fair to come into its own, and that dawning prosperity is well deserved. The possession, in commercial quantities, of high-grade coal with good coking possibilities is sure to have a tremendous effect on the commercial activities of the entire Similkameen district."

### MONTREAL MINING EXCHANGE.

The Montreal Mining Exchange announces officially that it is open for business again and is prepared to buy and sell mining shares at unrestricted prices.

The exchange closed up when the war broke out, along with all other exchanges, and has been idle ever since.

The re-opening of the Standard Exchange in Toronto for dealings in mining stocks has proved such a success that it has paved the way for dealings in Montreal.

### THE CYANIDE SUPPLY.

According to Mr. A. A. Cole, mining engineer of the Ontario Government Railway Commission, cyanide plants at Cobalt and Porcupine are well supplied with cyanide and satisfactory arrangements have been made for future supplies. Mr. Cole states in the November Bulletin of the Canadian Mining Institute that consumption in Northern Ontario is now 70 tons per month.

The mining companies now using cyanide in Northern Ontario are: At Cobalt:—Nipissing, Dominion Reduction, O'Brien, and Buffalo. At Porcupine:—Hollinger, Dome, McIntyre, Vipond and Porcupine Crown. To these will likely be added early in 1915; Cobalt Reduction, at Cobalt; and Tough Oakes, at Kirkland Lake.

The present price is 18 cents per pound.



## PERSONAL AND GENERAL

Mr. I. P. Rexford has resigned his position as a director of the Crown Reserve Mining Co.

The eighteenth annual dinner of the Engineering Society of Queen's University will be held on Dec. 15th, 1914, in Grant Hall.

At a meeting of the Council of the Canadian Mining Institute held in Toronto on Saturday, Dec. 5, it was decided to hold the annual meeting in Toronto in March, 1915.

Mr. M. E. Purcell, of Rossland, has been appointed a vice-president of the Canadian Mining Institute, to succeed the late W. F. Sutton.

Mr. H. P. H. Brumell, general manager of the Buckingham Graphite Co., attended a meeting of the Toronto branch of the Canadian Mining Institute on Dec. 5th, and gave an interesting talk on the graphite industry.

Mr. Gwynn G. Gibbins has returned to Montreal after making a six months' trip in the region of Great Slave Lake.

Mr. T. W. Gibson, Deputy Minister of Mines, has returned to Toronto after visiting Northern Ontario mining districts, including Sudbury, Cobalt, Porcupine and Kirkland Lake.

Mr. Hermann C. Bellinger, of Spokane, Washington, U.S.A., was at La Junta, Rancagua, in the province of O'Higgins, Chile, last month, on a visit to the Braden Copper Co.'s mines and smeltery. The mines are distant rather more than 200 miles by railway from Valparaiso, at an elevation of 8,000 to 9,000 ft., in a very rugged region on a part of the main range of the Andes mountains.

Mr. J. W. Bryant, for several years mine manager for the Tyee Copper Co., with mines on Vancouver Island, British Columbia, and afterward in Southern Yukon, near Windy Arm, is now manager for the Spassky Copper Mine, Ltd., a British company, having two main groups of properties in the Kirghiz Steppes, about 300 miles apart, one group being 200 and the other 500 miles from the nearest point on the Trans-Siberian railway, Russia. One group includes the Yuspensski copper mine, the ore of which runs high in copper.

Mr. Henry Harris, for seven or eight years general manager for the Tasmanian Smelting Co., with reduction works at Zeehan, on the west coast of Tasmania, is reported to have resigned that position and to have become manager of the works of H. J. Enthoven & Sons, Ltd., Rotherwhite, England. Mr. Harris before going to Tasmania was for some time assistant superintendent at the Brown Alaska Company's smelting works at Hadley, Prince of Wales Island, Southeast Alaska, under Mr. Thomas Kiddie, and in earlier years was assistant to Mr. Robert R. Hedley, then superintendent of the Hall Mines Co.'s smelting works at Nelson, B.C.

Mr. Robert C. Sticht, at one time superintendent of the A. S. and R. Co.'s smelting works at Great Falls, Montana, and in recent years general manager for the Mt. Lyell Mining and Railway Co., Ltd., with mines in the Mt. Lyell and other districts of Tasmania, and smelting works at Queenstown, in the same State of the Australian Commonwealth, was in New York City recently. He was announced to speak before the New York section of the American Institute of Mining Engineers on Dec. 2.

Mr. Melbourne Bailey, manager of Mr. John Hopp's placer gold mines near Barkerville, Cariboo, B.C., has gone to his home in Tacoma, Washington, U. S. A., for the winter.

Mr. Frank Breeze, mining superintendent for the North Columbia Gold Mining Co., operating hydraulic mines in Atlin district, British Columbia, has gone to Cincinnati, O., the company's headquarters, to report on the season's gold mining operations.

Mr. C. M. Campbell, superintendent of the Granby Consolidated Co.'s copper mines at Phoenix, Boundary district, B.C., has been in Vancouver consulting with the general manager concerning a resumption of work after four months' inactivity at mines and smelting works.

Mr. W. J. Elmendorf, general manager for the Portland Canal Tunnels, Ltd., has been spending a week or two at Victoria and Seattle, Washington, after having been nearly all the year engaged in superintending deep-level development in the company's mining property near Stewart, Portland Canal, B.C.

Mr. Newton W. Emmens, of Vancouver, B.C., after having been engaged several months in investigating mining conditions in Camborne, Ferguson, and other mining camps of the Lardeau country, for the British Columbia Department of Mines, has made a lengthy report on numerous mining properties he visited, and generally on the mining industry of the district.

Mr. W. J. Hamilton, manager of the Cerro de Pasco mines and smelting works in Peru, who early last month was in Montana, U. S. A., studying some of the new methods of the Washoe smeltery, is a McGill man, he having graduated from the university in 1888.

Professor Andrew C. Lawson has been appointed dean of the School of Mining of the University of California. Prof. Lawson is a graduate of the University of Toronto.

Dr. T. O. Bosworth, of London, Eng., is in Toronto after spending several months in the Northwest of Canada examining oil prospects.

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### OBITUARY.

#### William MacGarvey.

A brief cable from London, Eng., on Dec. 7, 1914, advised relatives in London, Ont., of the death at Vienna, Austria, of William MacGarvey, the millionaire oil operator.

Mr. MacGarvey was 71 years old and was born at Huntington, Quebec. His early experiences in the Petrolea oil fields made him wealthy and he was Mayor of Petrolea many years. On going to Europe he became a leader in the oil business. Many of his immense holdings in Galicia, have been battle centres in the present war and his losses have been enormous. Mr. MacGarvey was decorated by Emperor Franz Joseph and the British Admiralty for services rendered at different times.

His brother James was murdered by Russian brigands. Mrs. (Dr.) Westland, of London, is a sister. His daughter is the wife of Count Zeppelin, son of the dirigible inventor, and another daughter is the wife of Col. Lavadel, of the Austrian army.

Mr. MacGarvey successfully fought the Standard Oil Company, preventing it from securing large holdings in Austria. The town Mrianpol, which he founded and where he had two thousand employees, was wiped off the map in a recent battle between Russians and Austrians.



## SPECIAL CORRESPONDENCE

### COBALT, GOWGANDA, AND ELK LAKE

**Canadian Mining Institute.**—At the best attended and most enthusiastic meeting of the Cobalt branch of the Canadian Mining Institute has held for some time it was decided to invite the Canadian Mining Institute to hold their annual meeting in Cobalt this year. It was referred to the Council, which is now meeting in Toronto. The motion was proposed by Mr. Stewart Thorne, seconded by Mr. N. R. Fisher, and carried after some discussion. A feature of the meeting, if it were here in Cobalt, would be an excursion to Porcupine.

The annual meeting was to have been held in the West this year, but the secretary of that section of the Institute wrote stating that they would prefer that they should be allowed to have the meeting at some date when a larger proportion of the eastern members would be likely to go west. The alternate proposal was the visit to Cobalt. It was stated at the meeting that there was a disposition to hold the meeting at Cobalt in 1915, and that if arrangements could be perfected locally it probably would come north for the first time. The secretary of the Institute wrote suggesting that the annual dinner and meeting be held in Toronto and that the latter days of the meeting should be spent in Cobalt with an excursion to Porcupine. This did not meet with the approval of the members and finally it was decided to invite the Institute to Cobalt.

The chairman, Mr. B. Neilly, read a list of papers that would be given this winter that proved conclusively that the Cobalt branch will have a busy and interesting winter. Papers had been promised by Dr. J. Mackintosh Bell on the argentiferous veins of the Porcupine district, Mr. A. R. Globe will give a paper on the Hollinger mine, and Mr. R. B. Watson on the essential points in an annual report. Mr. Lorne Campbell gave a precis of his paper on the sampling of the Cobalt ores, which has already been published by the Institute. A short but interesting discussion followed. Mr. R. B. Watson, in asking some questions paid a tribute to the accurate sampling of the Campbell and Deyell plant and a very cordial vote of thanks was passed to Mr. Campbell for his address.

The branch passed a vote of condolence to Mrs. C. C. Farr on the death of the late Mr. C. C. Farr. Mr. Farr was not a member of the Institute, but he had always taken a keen interest in its doings.

There were between 30 and 40 members present.

**Buffalo.**—When the Buffalo mines started up on Dec. 7th, the last of the big mines which closed down when the war started, is working at full strength again. For the time the high grade mill and the refinery will not be run and the concentrates from the low grade mill will be stored until the price shows signs of improvement.

The Buffalo stopped most of its underground work in August, but has gradually been picking up men until they had between ninety and a hundred at work. Now they have two hundred on the pay roll, which is almost as many as when they ceased operations. A very vigorous plan of development has been outlined and is being carried out. All old employees were given preference out of the large number applying for work when the news became known that the property was resuming at full strength. Mr. T. R. Jones is himself

in sole charge of the property and has returned to Cobalt to live.

**McKinley-Darragh-Savage** has declared a regular dividend of three per cent. payable on January 1st. This brings the total up to 196 per cent. on the capitalization or \$4,404,708.

**Pebble Supply.**—The shortage of pebbles for the many mills in the Cobalt and Porcupine camp has been overcome by the finding of a market in Newfoundland. All the pebbles used in the mills before the war came from Denmark. Their shipment has been cut off by the war. It was stated before the war that the Newfoundland pebbles were not sufficiently hard and in consequence very few of them were used. They are now being given a fair trial. No less than 1,200 tons was purchased from Newfoundland some months ago to be distributed among the mines of Northern Ontario.

Quicksilver again is a commodity that has been greatly affected by the war. Much of it was being obtained from Austria before the war. Now that source of supply has been cut off, unless it is smuggled over the borders into Italy and shipped from the latter's neutral ports.

**Shipments.**—There have been practically no shipments of bullion during the past three weeks. Producing companies are storing all their bullion and are obtaining advances on it from New York. Little advantage is being taken of the Government's offer to back the banks if they would lend cash on bullion as collateral.

**Timiskaming** is having some success in development in the diabase at the 750 ft. level. Two veins of high grade ore have now been opened up and are being developed. A winze has been started on the main vein found at the 750 ft. and at 25 ft. down both grade and width were still good. At the mill twenty stamps are dropping with a capacity of between 60 and 70 tons daily.

**Curry.**—The only property at present working in the South Porcupine camp is the Curry. One hundred feet below the 300 ft. level a station is now being cut on this property, which adjoins the Wettlaufer. At this depth the vein is 18 in. wide of calcite, smaltite and niccolite; but silver values are small.

**Lignite.**—Interesting but altogether too indefinite to be of any importance is the discovery of lignite at the bottom of a well at North Cobalt. The discovery was made at a depth of 25 ft. when a householder was boring for water. The cutter brought up fragments of lignite, which were sent to laboratories by the Timiskaming and Northern Ontario Railway Commission. On analysis it was found that it was real lignite, with a 50 per cent. ash. The Timiskaming and Northern Ontario Railway Commission has let a contract to sink test pits to a depth of 25 ft. to discover the extent of the bed. The discovery was made within a hundred yards of the Nipissing Central railway tracks.

### PORCUPINE AND KIRKLAND LAKE

**Jupiter.**—The visit of all but one of the board of McKinley-Darragh-Savage directors to the Jupiter at Porcupine has excited a good deal of comment as to the action of the company in deciding as to whether they will take up the option on the Porcupine property. This option expires on Dec. 15th. Developments at the Jupiter mine have been much more satisfactory



latterly, and it is confidently anticipated that the option will be taken up, though no official announcement has been made to date.

**Teck-Hughes.**—The Nipissing Mining Company has made another payment on the Teck-Hughes. At the 185 ft. level the ore is very rich; but the shoot is not as long as at the upper level. The prospect was promising enough, however, to induce the big Cobalt company to make a payment.

**Goldfields, Limited,** at Larder Lake, has decided to close down indefinitely. A contract was let for 100 ft. of sinking some months ago, otherwise there has been no activity at the property for a year or more.

**Wolf Lake.**—The agreement between the Huronian Belt Mining Company and the owners of the Murray-Mogridge claims at Wolf Lake has been signed. These properties consist of large veins of low grade ore. The company has until the middle of next month before commencing work, and the first substantial payment will not be made for six months.

**Ogden.**—A contract has been let for a crosscut of 200 ft. on the Hayden Mining Co.'s property in Ogden township. The work will be carried on at the 100 ft. level.

**Dome.**—A difficulty has been encountered in the diamond drilling at the Dome mines. It was found that the drills were showing such a very decided deviation from the vertical that the value of the cores for a basis of the revaluation of the mine would have been questionable. The drills were accordingly pulled up and one is now being operated with a view of discovering if it is possible to put down holes straight enough to be of exact value in estimating the grade of ore available below the levels at which the mine is now being worked.

**Hollinger.**—For the four weeks ending Nov. 4 the Hollinger gross profits amounted to \$162,885. Ten dividends amounting to \$990,000 have been paid this year, and there is still a surplus of \$1,173,640. The mill ran 88 per cent. of the possible running time during the four weeks, treating 18,645 tons, all of which was Hollinger ore, although the development of the Acme is now proceeding very rapidly indeed. The average value of the ore treated was \$14.09 per ton, which is higher than the average. The milling costs were \$1.250 and the mining costs \$2.232 per ton, and total costs were \$4.488 per ton. In the mining costs the amount spent in exploration is still negligible, the amounts being constituted as follows: Exploration, \$0.064; development, \$0.538; production, \$1.630.

At the 800 ft. level ore has been cut in a winze. This ore is of average grade and width and is in all probability No. 1, although it was not cut in exactly the same position as anticipated. As two units of the central air compressing plant are now in operation, it is possible to at last obtain a more desirable ratio of drills on development and exploration compared with those on production. The actual ore reserves of the mine should be very largely extended within the next six months.

## BRITISH COLUMBIA

**Granby.**—One of the chief items of British Columbia mining news at the beginning of December was an announcement that the Granby Consolidated Mining, Smelting & Power Co., was arranging to resume operations at its copper mines, near Phoenix, Boundary district, and its smelting works at Grand Forks. Early in August, following the practical collapse of the metal markets and the consequent suspension of sales of copper, the

company found it necessary to close its mines at Phoenix, the copper content of the ore occurring there being too small to allow of operations at a profit under then existing conditions of low prices and little demand for copper. The company continued work at its Hidden Creek mines and smelting works at Anyox, Observatory inlet, however, for the ore being mined at that Coast district property contains more than twice as much copper as that at Phoenix, so approximately 1,000 tons of ore a day has been smelted throughout the months that have elapsed since the commencement of operations at the Anyox works.

The effect of the closing of the Granby mines and smelting works in Boundary district was distinctly bad,



Prof. GEO. GUESS, University of Toronto  
To whom is attributed much of the credit for improved smelter practice at Anyox, B.C.

especially for married employees of the company, for with the exception of the Jewel gold mine, there was no other mine within fifty or more miles of Greenwood or Phoenix at which work was being done, other than a little prospecting, or to meet annual assessment requirements. Some of the men from both mines and smelter went north, to Anyox, but a considerable number remained in the Boundary, and with the winter coming on the outlook for them was most serious. Under these circumstances a meeting was held at Phoenix on November 12, "to consider suggestions for the amelioration of distress consequent on the closing of the mines, the only source of local revenue." At that meeting, the company's mine superintendent stated that he had some time previously addressed a letter to the general manag-



er outlining the situation at and around Phoenix, and suggesting that, if possible, the company proceed with certain development and exploratory work. Unfortunately, however, he had received an unfavorable reply, the company's attention being for the time directed to its affairs in connection with its Hidden Creek mine. He thought, though, that as the Government had seen fit to bonus the lead, iron and steel industries, there was no good reason why the line should be drawn at the copper industry. Although he could not speak with authority, he ventured the opinion that if some inducement was held out by the Government, the Granby Co. directors might be induced to operate its local mines and smeltery on a reduced scale. He did not know whether or not the feeling was general, but he had heard that there was a disposition among some of the men to accept a reduction of wages for the time being. There was one thing quite evident, namely, that there was no profit for the Granby Co.'s Phoenix mines with copper at only 11 cents a pound. After discussion, the meeting adopted the suggestion of the district representative in the Provincial Legislative Assembly and appointed a committee to draw up a statement of local conditions with recommendations made at the meeting and arrange for that committee accompanied by himself to wait on the Provincial Government.

At the end of November the general manager of the Granby Company and the district representative discussed the matter in Victoria with the Premier, Sir Richard McBride, who is also Provincial Minister of Mines, and as a result it was announced on December 1 that the Hon. the Premier had informed the Victoria Daily Colonist that a deputation from Boundary district had "made such representations to the Government and the Granby Co. as were helpful toward a successful solution of the problem involved in the re-opening of the Granby Co.'s mines and smeltery in Boundary district and the operating of its mining and smelting plants during the war."

In this connection, the Daily Colonist published the following statement made to it by the district representative: "The news of the re-opening of the Granby Co.'s plants in Boundary district will prove very welcome to the large number of men who were thrown out of employment when the company was compelled to discontinue mining and smelting operations nearly four months ago. Phoenix is purely a mining camp, and practically all the mining men living there have been out of work since early in August. The problem of relieving such a distressful situation has for some time been engaging the attention of all who have at heart the interests of that part of Boundary district. It was my privilege as member for the district to accompany a delegation from Phoenix when the members of it waited on the Premier and Attorney-General. As a result of our conferences and subsequent representations to the company, it has decided to resume operations at Phoenix and Grand Forks, although, of course, on a somewhat restricted basis. I have just been informed that the company intends to resume work at both those places during the first week in December, and to this month operate two blast furnaces, these together having a capacity of 900 tons of ore a day. In January four furnaces will be in blast, and then the works will be operating at about one-half its full capacity, and will treat 1,800 tons of ore a day. While the direct benefit to the men who will thus be again employed is obvious, the re-opening of the Granby Co.'s plants will have a much wider influence in restoring better conditions, for the railways which have been operating with fewer crews will

now employ more men, and there will, as well, be more men employed in mining coal and making coke at Crowsnest collieries."

### General News.

The total quantity of ore from Rossland mines received at the Consolidated Co.'s smelting works at Trail during the eleven expired months of 1914 is approximately 264,000 tons.

The lead content of ore and concentrate received at Trail during ten months ended Oct. 31, 1914, was 45,287,856 lb. Allowing 4,000,000 lb. for December, it appears as if there will be a decrease of 6,000,000 lb. this year as compared with the total for 1913.

A carload of silver-lead ore has been shipped from the Early Bird, a small property situated on the west shore of Kootenay lake, near the town of Ainsworth. No ore was shipped during November from any other mine near Ainsworth, although development work was done on several properties.

At Princeton a local association is endeavoring to arrange for a comprehensive exhibit of minerals from Similkameen district to be included in the Canadian mineral exhibit at the Panama-Pacific Exposition, to be opened in San Francisco, California, next February.

Zinc ore is being shipped from the H. B. mine, near Salmo, Nelson mining division, to the Mineral Point Zinc Co.'s smeltery at Perdue, Ill., U.S.A. There is in the H. B. mine a large deposit of oxidized zinc ore, in places associated with lead ore which latter is sent to Trail as fast as mined, more than 2,000 tons of this product having been shipped in 1914.

Less than 1,000 tons of silver-lead ore was shipped from Slocan mines during eight weeks ended November 26. The chief individual shipping mines were: Rambler-Cariboo, 445 tons; Hewitt, 130 tons; J. L. Retallack & Co., (Whitewater group), 123 tons; Slocan Star, 84 tons; Ruth, 83 tons, and Utica, 35 tons. Much development work is being done at other mines, some of which are preparing to ship when the snow roads and trails shall be hard enough for rawhiding or packing.

Last month a new arrangement was made for working the Crow's Nest Pass Coal Co.'s Coal Creek mines, this to be continued while the demand for coal is insufficient to require longer time to be worked. Morning shifts are worked each week in successive order until the required quantity of coal has been produced. It is stated that this arrangement obviates dissatisfaction that might otherwise be caused by an irregular method of working the coal mines.

The Hedley "Gazette" states that the Hedley Gold Mining Co.'s new power plant is slowly nearing completion, but much work remains to be done before it will be generating electricity. The cement work at the power house is not being done so fast as earlier, owing to a number of the men being idle while teams are hauling the generating machinery from the railway station at Hedley to the power house, a distance of between one and two miles.

Slocan mining notes include the following: A car of ore from the Mountain Con mine gave returns of silver to the value of \$686 to the ton of ore. A car of ore is being taken out at the Mercury; this ore assays 265 to 285 oz. silver to the ton and about 45 per cent. lead. The working forces at the Standard and Hewitt mines, near Silverton, were reduced about the middle of November, and it is possible still more men will be discharged unless better prices shall be obtainable for silver and lead than have ruled lately. Work has been stopped at the Apex, at which several men have been doing development the greater part of the year.



### MINING IRON ORE.

Mr. P. B. McDonald in an article in *The Engineering Magazine*, says of mining methods in the Lake Superior iron districts:—

"The mining and stoping methods that have been introduced and contrived in the iron mines, usually by the ingenious Cornishmen, partake of a wide variety. In the extraction of such wide ore bodies, with often none too firm walls, it was obvious that if the ore was removed, leaving large open rooms, it would be dangerous to walk in them, on account of falling masses loosened by cracks and water. Iron ore is at best treacherous ground. Thus, a number of methods of stoping were perfected, which either allow no large open rooms, or else leave them behind in worked-out portions of the mine where it is never necessary for the miners to go. The free use of timber for holding up the back or roof was possible at first, but has become increasingly expensive, as timber rose in value, and the most popular methods are those which use little or no timber. Another consideration is the necessity for getting the ore out cheaply, consuming as little dynamite and as little manual labor, such as shovelling, as possible.

"As an illustration of a method which requires little timber, dynamite, and labor, the following is a system suitable for a wide ore body of medium hard ore. A great block of ore 250 by 200 by 100 feet high, is undercut 8 feet deep along one side, one end, and underneath, the exact amount of undercutting varying with the characteristics of the ore. The final removal of pillars from underneath the block is accomplished by simultaneous blasting. The block is then left to itself for seven or eight months, during which time it slowly caves down and grinds itself into small pieces suitable for shovelling. This tendency of some iron ore to rack and grind itself into small fragments, when undercut, is rather a peculiar fact; it of course saves breaking the ore up by dynamite. The whole affair takes place several hundred feet underground, and no one can see the grinding process taking place, as it would be dangerous to go into those workings, the miners being employed at other places in the mine. To remove the broken ore to the surface, timbered drifts can be driven in the loose material for shovelling into tram cars, or the caving could have been carried on above the main level, about 25 feet, in a "sub-level," and the broken-up ore now drawn off in chute-raises from which tram cars are loaded just as at a coal dock.

"Caving methods permit of much variation according to the form of the ore body, hardness or softness of the ore, etc. In nearly all of them, the surface of the ground over the ore body slowly settles down as it is undermined, and it is sometimes necessary to keep this surface material (sand and pebbles) from mixing with the ore by layers of timber laid closely. It is usual to cave from level to level as the mining goes deeper, the levels being generally 100 feet apart. With a very soft ore, caving in 10 or 12 feet horizontal slices is resorted to, working from the top down, hence the term top-slicing. If the ore is high grade as well as soft, and it is desired to get it all, shovelling and hand methods may be necessary, in which by removing 6 or 7 feet of a slice, only 3 or 4 feet can be caved, after which the sand or waste rock follows, kept from mixing with the ore by a matting of timber. Wheel-barrows or little sub-level cars may be used to get the broken ore to the chutes for dumping to the main-level tram cars (probably drawn by an electric loco-

tive), but wherever possible the ore is blasted or caved directly into the chutes, to save shovelling and handling, which are expensive. By systems of chute-raises and sub-levels (of which there may be three, 25 feet apart, between the main levels) the shovelling is frequently reduced to a minimum and made necessary only in driving the drifts and sub-drifts."

### MINING MEN AT THE FRONT.

Mr. T. A. Rickard, editor of the *Mining Magazine*, London, has the following in the December 5 issue of the *Mining and Scientific Press*:—

Two days ago I went to the Hotel Cecil to see the Sportsman's Battalion, which assembles at that famous hostelry. More particularly I went to see my friend J. H. Curle, the author of "The Gold Mines of the World," a writer well known on both sides of the Atlantic, and a former special contributor to the *Press*. The battalion consists of such men as himself, over age according to the recruiting requirements, but fit for military service and anxious to fight for their country. From 10 to 15 per cent. of those now in the battalion are too old or otherwise unfit, but the rest are first-rate material. Curle tells me that they have come from every corner of the map. He himself had just returned from Guiana, another in his section hailed from Trinidad, another from the Argentine, a fourth from Singapore, and a fifth from the Gold Coast. Among those in this battalion, which is attached to the Royal Fusiliers, are several mining men: J. H. Curle, W. S. Holloway, F. P. Bray, A. G. Bevan, G. R. Nicolaus and W. H. Rundall. They have now gone into camp at Romford, in Essex, to prepare for active service. Curle has a high opinion of his comrades; he says that he would go with them anywhere. They will give a good account of themselves, no doubt.

By the way, one of the London Scottish officers, writing home, explains that before going into action they had to spend several days getting used to the sight of the horrors of slaughter, which at first will nauseate and unnerve any man. The heaps of dead and dying on both sides, on the battlefield in Flanders are such as to appall the average man. Another soldier tells me he had not believed the stories of mass attack until he was in the trenches facing one of these assaults. The Germans came onward bravely and so thickly that he felt sure that every shot he took must have gone through half a dozen of them. Then when our fellows used the bayonet they screamed like wounded hares. No wonder. "Did you ever cry?" I asked. "Yes," he said, "one day I had been firing fast when my rifle jammed. I blubbered. It was the worst thing that could happen. But I knew that the regimental armorer was in a cottage a couple of hundred yards to the rear, so I bolted across the shell-swept ground to reach him. Half way across I heard a roar and glanced over my shoulder to see that a shell had fallen in the trench just where I had been placed. A second later another shell smashed the roof of the armorer's cottage and killed him. I took cover behind the ruined wall and found a brick, with which I loosened the breech-block. Then I felt better."

### PORCUPINE VIPOND.

Production at the Vipond mine, Porcupine, in November is said to have been about \$25,000. Good progress has been made since the company was reorganized some months ago.



## THE FIGHTERS

(From "London Daily Mirror.")

Kitchener sat in his London den,  
 Silent and grim and grey,  
 Making his plans with an iron pen,  
 Just in Kitchener's way.  
 And he saw where the clouds rose dark and dun  
 And all that it meant he knew:  
 "We shall want every man who can shoulder a gun  
 To carry this thing right through!"  
 Bravo Kitchener! Say what you want,  
 And the world shall know, where our bugles blow,  
 We've a man at the head—to-day!

Jellicoe rides on the grey north seas,  
 Watching the enemy's lines,  
 Where their lord high admirals skulk at ease,  
 Inside of their hellish mines.  
 They have drunk too deep to the boasted fight,  
 They have vowed too mad a vow!  
 What do they think—on the watch—to-night?  
 What toast are they drinking now?  
 Bravo, Jellicoe! Call them again,  
 And whenever they take the call  
 Show them the way, give them their "Day!"  
 And settle it once for all!

And French is facing the enemy's front  
 Stubbornly day by day,  
 Taking the odds and bearing the brunt,  
 Just in the Britishers' way.  
 And he hears the message that makes him glad  
 Ring through the smoke and flame:  
 "Fight on, Tommy! Stick to them, lad!  
 Jack's at the same old game!"  
 Bravo, Tommy! Stand as you've stood,  
 And, whether you win or fall,  
 Show them you fight as gentlemen should,  
 And die like gentlemen all.

So Kitchener plans in London Town,  
 French is standing at bay,  
 Jellicoe's ships rise up and down,  
 Holding the sea's highway.  
 And you that loaf where the skies are blue  
 And play by a petticoat hem  
 These are the men who are fighting for you!  
 What are you doing for them?  
 Bravo, then, for the men who fight!  
 To hell with the men who play!  
 It's a fight to the end for honor and friend,  
 It's a fight for our lives to-day!  
 —FRED E. WEATHERLY.

## MINING CONGRESS DISCUSSION.

At the meeting of the American Mining Congress, held in Phoenix, Arizona, last week, President Carl Scholz introduced two important subjects, namely: Arbitration of Industrial Disputes and Workmen's Compensation. His views were briefly put as follows:—

"It must remain a matter of honor between the two interests to avoid industrial conflicts. Under our constitution no compulsory measure can be enforced. It is not fair to ask employers to yield to unreasonable demands of employees because of any special or unusual business conditions existing, or by this denial bring about business interruptions or even bloodshed.

Likewise, is it not proper that employers should take undue advantage of their men under stress. Such actions encourage discrimination or other unreasonable attitudes at opportune occasions. Interruptions to mining do not end by affecting the employers and mine owners; the damage to the consumer and user of mining products may be much greater. I need only call attention to the expense which our coal consumers are put to every two years by storing vast quantities of coal in the face of uncertainty regarding the renewal of expiring wage agreements. Appeal to the patriotic spirit is not a cure, and it is proper that we duly consider the best solution of the subject by discussing it from every viewpoint and form some basic opinions.

"State legislation is more or less contagious—if one state considers a certain measure, and particularly one which meets popular favor, other states will endeavor to adopt it. The Workmen's Compensation bills have furnished their share of opportunity to the spectacular politicians by supporting this popular legislation, frequently under the disguise of desiring to appear more progressive and liberal than neighboring states. Many bills have been proposed which are unworthy of the cause they represent, and modifications will be proposed at the coming sessions.

"There is no question but that each industry should bear the cost of its toll of life and injuries. The injured workmen or their families should not be dependent upon charity. There may be no difference between the services of a soldier who draws a pension for giving his services to his country to defend it, perhaps, only for a short time, and the workman who gives his entire lifetime to build it up. The employer, to meet these expenses, must be placed in a position to earn the cost of this protection. The schedules of compensation must be fair to both sides, else the employers will not place themselves under the acts, which are optional and under our constitution cannot be made compulsory. The present method of litigation is wasteful, deprives the needy at the time when assistance is of the greatest value, often giving the greater sums to those least entitled, at the expense of those really deserving. This condition should not be permitted to continue.

"My own opinions differ somewhat from the expressed view of our committee, insofar as I believe the workmen should contribute a part of the cost of this insurance. It will make the plan more valuable to them. Their self interest will prevent unfair payments, because increases would have to be borne in part by themselves. Their ability to contribute can only be measured by the readiness with which the organized men pay dues and assessments, about 2 per cent. of their gross earnings being given to the union fund of the organized coal fields. Should they contribute an equal amount to the compensation fund in addition to the equivalent added by the employers, we would have a fund of 3 to 3½ cents per ton of coal, which is considered adequate at this time. Such contributions would entitle them to representation in the administration of the fund, which should be kept out of the reach of political influence.

## TECK-HUGHES.

President A. D. Crooks is credited with stating that development work at the Teck-Hughes mine, Kirkland Lake district, is progressing favorably and that the Nipissing Company, which is doing the work under an option to purchase, has made payments as they have come due.



**DIVIDENDS OF AMERICAN MINES AND WORKS.**

Despite the fact that the American metal market has been about the most unsatisfactory in the history of mining, 119 companies paid dividends during the 11 months just ended totaling \$69,401,778. Add to this the disbursements of six securities-holding corporations of \$18,715,396 and we have a total of \$88,117,174. These figures are verified by reports made to Mining & Engineering World and are surely indicative of what a really great industry mining is, and what it can do under the most adverse conditions.

Reports available for a number of years back add further proof to the claim that mining when carried on as a business proposition is one of the most lucrative among American industries. A careful compilation of these reports shows that the 119 companies paying dividends so far in 1914 have enriched holders of their stock in the magnificent sum of \$1,085,681,600.

During 1914 but 23 copper companies paid dividends (as compared with 34 in the same period in 1913) of \$30,606,897 (\$43,607,211 in the 11 months of 1913). These 23 properties since incorporation have yielded profits in the shape of dividends amounting to \$413,584,141.

Eighty-seven companies operating properties classed as gold-silver-lead-zinc producers, paid dividends during the 11 months of 1914 amounting to \$24,714,728. Since incorporation these companies have disbursed \$306,210,315 on an issued capitalization of \$257,939,952.

Sixty-one of the above are located in the United States and they have to their credit for the year \$14,865,057 and since incorporation \$223,156,264, on an outstanding capital of \$179,805,923.

Twenty-one Canadian properties in the above class disbursed \$8,560,023 in 1914 and \$62,006,454 to date. This was done on an issued capitalization of \$62,596,326. When it is considered a large majority of these properties have been operated but a few years the result is certainly remarkable.

But five Mexican gold-silver-lead-zinc companies report dividend payments in 1914, these distributing \$1,299,654 and since incorporation \$21,047,597.

Seven metallurgical companies have had an excellent 7-months period for they have to their credit disbursements totaling \$12,631,209. Total disbursements amount to \$172,591,011.

The accompanying table gives the amounts of dividends paid during November, the date of payment and the amount per share.

	Per	
	Nov. share.	Amount.
Alaska-United, Alaska .....	28 \$ .20	\$ 36,040
Alaska-Treadwell, Alaska .....	28 1.00	200,000
Alaska-Mexico, Alaska .....	28 .20	36,000
Amalgamated, Mont. ....	30 .50	769,430
Amparo, Mex. ....	10 .03	60,000
Bunker Hill Con., Cal. ....	4 .02½	5,000
Caledonia, Idaho .....	5 .02	52,100
Center Creek, Mo. ....	1 .05	5,000
Coniagas, Ont. ....	2 .30	240,000
Crown Reserve, Ont. ....	16 .02	39,990
Fremont, Cal. ....	28 .02	4,000
Golden Cycle, Colo. ....	1 .02	300,000
Hazel, Cal. ....	5 .01	9,000
Hecla, Idaho .....	20 .01	10,000
Hollinger, Ont. ....	4 .15	90,000
Homestake, S. D. ....	25 .65	163,254
International Nickel, pfd. ....	2 1.50	138,689
Lucky Tiger, Mex. ....	20 .18	128,760

Nevada Wonder, Nev. ....	21 .05	7,041
Parrott, Mont. ....	30 .15	34,478
Right-of-Way. ....	16 .01	16,855
South Eureka, Utah .....	15 .07	20,999
Tomiscoming & H. B., Ont. ....	10 .07	23,283
Tom Reed, Cal. ....	20 3.00	36,382
United Verde, Ariz. ....	2 .75	225,000
Wasp No. 2, S. D. ....	15 .01	5,000
Yellow Pine, Nev. ....	25 .02	20,000
Yellow Aster, Cal. ....	25 .05	5,000

**CANADIAN MINING INSTITUTE**

A meeting of the Toronto Branch of the Canadian Mining Institute was held on Saturday, Dec. 5th, at the Engineers' Club. Several members of the Council, including President G. G. S. Lindsey, M. B. Baker, of Kingston; D. B. Dowling, Ottawa; Secretary H. Mortimer-Lamb, Montreal; A. A. Cole and Norman Fisher, of Cobalt; Dr. W. G. Miller, C. E. Smith, and James McEvoy, of Toronto, were present.

It was announced by members of the Council that the next annual meeting of the Institute will be held in Toronto. The Cobalt delegates brought an invitation from their Branch to hold the meeting at Cobalt. While several members of the Council favored this, a majority thought it would be inadvisable to go to Cobalt this year, and it was finally decided to meet in Toronto in March next.

President Lindsey gave some account of the condition of affairs of the Institute, and asked members not to forget that the Institute needs their assistance more than ever this year on account of conditions brought about by the war.

Mr. Cole and Mr. Fisher extended the greetings of the Cobalt Branch and told of the flourishing conditions of Porcupine, and of the fairly satisfactory conditions at Cobalt.

Mr. Dowling gave some account of the situation in the Calgary oil field, explaining that two companies are obtaining some oil, though not in large quantities.

Mr. Baker referred to the proposal to change the method of presenting papers at the Annual Meeting, urging that less time be given to the presentation of papers, and more time to discussion.

Mr. Lamb stated that several papers have been promised for the annual meeting.

Mr. H. P. H. Brumell, general manager of the Buckingham Graphite Co., gave an interesting account of the graphite industry in Canada. Replying to questions, he described the methods of treating the ore, and outlined the course of investigation which resulted in the designing of a very satisfactory method of concentrating the graphite flakes.

Deputy Minister T. W. Gibson was present for the first time in several months. He was heartily welcomed, and congratulated on his improved health.

Mr. Gibson has recently returned from a visit to Northern Ontario mining district, and in a brief talk he spoke very encouragingly of the industry.

The next meeting of the Toronto Branch will be held on Dec. 19th, at the Engineers' Club.

The mine output of gold in Colorado was valued at \$18,146,916 in 1913, against \$18,588,562 in 1912, a decrease of \$441,646.

The Cripple Creek district (Teller County) produced \$10,905,003 in 1913, or 60 per cent of the State yield, against \$11,008,362 in 1912.

### COBALT SHIPMENTS.

Cobalt, Ont., December 7.—For the third time within the past six weeks, no bullion has left the Cobalt camp in the week. With the suspension of shipments from Nipissing, only some of the smaller shippers are left and these mines have bullion every other week. No announcement has been made by Nipissing regarding the shipment of bullion now stored at the property.

The steadier price of silver within the past few days is no doubt responsible for the larger shipments from camp and a further increase this month would result in an exceptionally heavy shipping list from the mines.

The Mining Corporation of Canada figure well up on the list during the week. From the Cobalt Lake three cars of high grade ore and concentrates went to Deloro, while the Townsite and City of Cobalt mines shipped one car of high grade to Denver.

McKinley-Darragh and Crown Reserve each had a car of high grade material, the latter being composed of high grade ore only, and La Rose sent out 43 tons of low grade.

The ore shipments for the week are:—

Mining Corporation of Canada :	
Cobalt Lake Mine.....	193,060
Townsite and City of Cobalt Mines.....	87,410
LaRose Mines. ....	86,220
Coniagas Mines . ....	125,880
Crown Reserve . . . . .	37,545
McKinley-Darragh . . . . .	61,600
Dominion Reduction Co.....	168,800
Total .....	760,515

### Silver Bullion Shipments.

The bullion shipments for the week ending Dec. 11th, were:

	Oz.	Value.
Nipissing. . . . .	312,233.91	\$154,946.08
Dom. Red. Co. . . . .	55,419.00	27,400.00
Crown Reserve . . . . .	30,500.00	15,000.00
	398,152.91	\$197,346.08

### COPPER EXPORT SITUATION.

The Wall Street Journal says:—"Italian steamship lines, operating out of New York, continue to refuse copper for shipment to north and south European ports. From this it is adduced that the conferences to date at Washington, between the diplomatic representatives of the several countries concerned, as to the status of export copper to neutral final destinations in neutral bottoms, have failed to provide a basis on which such copper may be handled without risk of delay or possible loss.

"Great Britain's stand on the export copper question seems to be one of calling into question every shipment that arrives in European waters; in other words, to assume the probability that every cargo of copper is destined ultimately for Germany or Austria. By way of justifying this stand, Great Britain is seeking to make clear that there has been an actual and material increase of imports of copper by neutral countries circumjacent to Germany, Austria and Turkey; that there is, in fact, an excess current absorption of copper by those neutrals and that this excess is sent across the borders into belligerent territory.

"Statistics have been collected by the British authorities bearing on the copper imports of the neutral countries on the consideration for a series of years past, to-

gether with other German statistics, and some of these are reported to have already been submitted to the State Department by the British Ambassador at Washington.

"The State Department is said to still have under examination the right of the British authorities to interfere with copper shipments to neutral countries. In connection with this, the department is also considering the arguments presented by the four big copper producers of the United States, protesting against interference with copper shipped in neutral vessels and billed to neutral consignees."

### HOLLINGER.

The report of General Manager P. A. Robbins for the four weeks ending Nov. 4 1914, shows that Hollinger Gold Mines, Ltd., in that period made a gross profit of \$162,885.42, or over \$40,000 per week. The profit from Jan. 1 to Nov. 4, 1914, was \$1,477,956.16. During this period \$990,000 was distributed in dividends, and the surplus was increased from \$668,462.80 to \$1,173,640.38.

During the four week period ending Nov. 4, there was expended on plant \$31,237.03. Of this \$26,675.59 was for mill extension.

There was hoisted 18,434 tons ore, 3,133 tons from development and 15,301 from stopes. The average value of the ore hoisted was \$14.09.

Mining cost was \$2.23 per ton and milling cost \$1.25

The mill ran 88 per cent. of the possible running time, treating 18,645 tons, all of which was Hollinger ore.

The new central air compressing plant of the Canadian Mining & Finance Company, Limited, has been put into operation and the increased supply of air is making it possible to push underground development.

The 800-ft. level has been reached by a winze and ore (probably No. 1 vein) has been encountered at that level.

### COPPER SEIZURES.

The steamship Ran has been seized by the British and taken into Liverpool. This vessel was bound for Sweden with a small cargo of copper, but must now share the fate of two ships preceding her to that country.

Within a fortnight the steamship Sif, destined for Malmoe, a naval port in Sweden, was taken off the coast of Scotland and the copper removed from the cargo. Early last week the steamship Sigrun bound for the same port and under similar conditions, was taken into Newport, while the Ran was conveyed into Liverpool on Tuesday. It is understood that between 1,500 and 2,000 tons of copper were on the three vessels.

The refusal of steamship companies to handle copper for Mediterranean ports during the past week or two has brought about lessened activity on the part of the British navy off Gibraltar, where about a dozen vessels were taken, all of which were forced to proceed without their copper.

Total copper seized by Great Britain, although consigned to neutral countries, now approximates 30,000,000 pounds.

### GEOLOGICAL SURVEY PUBLICATIONS.

The Geological Survey has issued Museum Bulletins No. 3, The Anticosti Island Faunas, by W. H. Twenhofel, and No. 4, The Crownsnest Volcanics, by J. D. MacKenzie.

Recently published geological maps are Texada Island, B.C., and Franey mine and vicinity, Victoria Co., N.S.



### USE OF MUD IN WELL DRILLING.

According to I. N. Knapp in a paper prepared for the February 1915 meeting of the American Institute of Mining Engineers clear or turbid water circulated in rotary drilling will erode the walls of the well particularly in loose sands and sandy materials and cause them to cave and to lose their cylindrical form. Sticky clays and such unconsolidated strata as can resist the erosion of circulating clear water will drill much faster with it than with mud on account of its solvent action. It is a matter of necessity however, to start with and keep a mud circulation of a standard that will resist erosion of the weakest sand strata, if the well is to be kept in proper cylindrical condition for successful cementation and completion. If the walls of a well in sand or other material cave, a large amount of such material will come out with the overflow. This caving increases enormously the area to be mudded off.

Clear or turbid water flowing on the surface will erode unconsolidated materials, the rate depending upon the velocity or grade and upon the volume. It has also a solvent or slacking action on earthy matter. If such flow was, for instance, through a shallow ditch it might perhaps cause the banks to cave sufficient to make a meander outside of the dug channel. If, however, clayey matter is added to the flowing water the erosive action weakens until a point is reached where erosion practically ceases and the suspended matter will begin to build up and protect the loose material. The solvent action also will be very much weakened and in such a case a shallow ditch in loose material will tend to keep its shape as dug. Clear water will continue to sink in sand or porous material in quantity for an indefinite time. Turbid water will gradually render sand or porous material impervious, but the suspended matter will be carried in and deposited in the sand to a considerable depth. A good mud (or mud-laden water) will render sand or porous materials impervious almost instantly and the penetration of the mud is small. These are all matters of common observation.

### THE EXHAUSTION OF U. S. COAL FIELDS.

Mr. Carl Scholz in his presidential address to the American Mining Congress on Dec. 7, said of the coal resources of the United States:—

"I am not competent to speak authoritatively on the great amount of mineral resources available, but I have often endeavored to reconcile the statements published by the U. S. Geological Survey on the vast amount of coal available in certain fields with which I am quite familiar. These statements refer to all the coal in existence without distinguishing as to the cost of extraction; in fact, all government reports are silent on this point, and the ordinary reader naturally believes that the billions of tons of coal available can be produced at no greater cost than the present supply. This cannot be true, and in less time than the average man believes we will be forced to recognize the fact that even the largest coal fields are being exhausted very rapidly, and that the remaining coal while available, will cost many times over the present cost of production. Even within the limit of my personal experience many important mining centers have abandoned or gone back in their production. This may not indicate extraction of all the available coal, but certainly no more coal will be produced in these sections at the

present prices, and undoubtedly large proportions of the abandoned territories are lost forever, or can only be recovered at a greatly increased, or perhaps prohibitive, cost. The average life of a coal mine in this country is rarely in excess of 25 years. In the major portion of our coal fields, particularly the interior sections, rarely more than two or three workable veins exist in the same territory, frequently only one. I may mention the production has diminished, such as the northern coal field of Illinois and the Hocking Valley field of Ohio. In the Great Kanawha district of West Virginia all of the coal along the river has been worked out or abandoned and the newer mines have been located along creeks and tributaries to the river. If these mines are worked out in as short a period as those along the river front, it will not take very many generations to exhaust the field."

### LARGE INCREASE IN U. S. ZINC EXPORTS.

All records in exportations of U. S. zinc were surpassed during last three months, at 65,504,574 pounds, valued at \$1443,381, compared with 1,346,877 pounds, valued at \$80,756, a year ago. A Washington report states that exports of domestic zinc in pigs, ingots, bars, etc., in last three months exceeded the total for the seven-year period ended June, 1914. In last four fiscal years zinc exports averaged 12,800,000 pounds per annum. In 1897, the former record year, the total was 35,869,987 pounds. That was surpassed by September last, with 38,090,144 pounds.

The unusually large exports were sent chiefly to Europe. In September, when exports of zinc pigs, etc., rose to the highest point ever known, 28,000,000 pounds was sent to England, 3,000,000 pounds each to Scotland and France, and 333,000 pounds each to Denmark and Italy, while 1,250,000 pounds went to British Africa, and 250,000 pounds to Australia.

Exportation of 65,504,574 pounds in three months ended with October represents about 10 per cent. of annual domestic product, which in 1912 amounted to 647,814,000 pounds.

### GRANBY CONSOLIDATED.

Boston—A production of 2,000,000 pounds of copper from two furnaces of the Hidden Creek smelter during November was accomplished, according to preliminary returns. In October the yield was 1,794,308 pounds turned out at a cost of 6½ cents a pound at the smelter. An even better showing in the matter of costs may be shown for the past month.

By the first of July Hidden Creek will have a largely increased output at a cost of close to 7½ cents a pound, f.o.b. New York.

Against less than 18 pounds recovery from the Phoenix property, now idle, the Hidden Creek mine has been yielding 40 pounds of copper net per ton. The ultimate cost at this property will be lowered to seven cents a pound if indications prove up.

The company has placed its management control in the hands of an "operating committee" of three directors—something unique in mining affairs.

Lake Superior iron ore shipments for season of 1914 totaled 32,021,000 tons, or 17,048,000 tons below the movement of 1913.



### COAL MINING PRACTICE IN ILLINOIS.

The explosion at the North Mine, Royalton, Illinois, on October 27, 1914, in which 52 lives were lost, adds force to the recommendations leading to safer mining made in Bulletin 8, Coal Mining Practice in District VI., by S. O. Andros. This bulletin, published by the Illinois Coal Mining Investigations Co-operative Agreement, describes methods of mining in bed 6 east of the Duquoinanticine in Frankline, Jackson, Perry and Williamson Counties. This district, with an annual production of over 12 million tons, is one of the most important in Illinois and its undeveloped coal resources are so great that it will doubtless become the most important. The output of the district is 20.8 per cent. of the total production of Illinois. The face workers average 7.6 tons of coal daily as compared with an average of 5.9 tons per face worker in the mines of all other districts in the State.

Bed 6 in this district varies in thickness from  $7\frac{1}{2}$  to 14 feet and averages over 9 feet.

The subject of ventilation is a vital one to the district inasmuch as there have been serious explosions of gas and dust in many mines resulting in much loss of life and destruction of property. The disastrous explosion at the Zeigler Mine in 1905 and the fire in 1908 will be recalled by those familiar with Illinois mining history. Frequent explosions of less magnitude in other mines, many of them resulting in loss of life and all of them entailing great expense in recovering the mine or a portion of it, have caused this district to be regarded properly as a dangerous one.

Copies of this bulletin may be obtained upon request from the Illinois Coal Mining Investigations, Urban, Illinois.

### IMPORTS OF CYANIDE.

According to J. McLeish, chief of the division of statistics, Mines Branch, direct returns have not been received from Canadian mining companies with respect to their consumption of cyanide, but in view of the fact that there is no local production, a fairly accurate estimate of the consumption in Canada will be furnished by the record of imports. The imports of all cyanides for metallurgical purposes in 1911 totaled 308 tons, or an average of about 25 tons per month. The imports in 1912 totalled 475 tons, or an average of nearly 40 tons per month. The imports in 1913 totaled 708 tons, or an average of 59 tons per month. During the first six months of 1914 the imports totalled 227 tons, or an average of only 38 tons per month, but in the month of August the imports increased to 130 tons.

The large increase in August was due to anxiety concerning the supply. There is now good reason to believe that all ordinary orders can be filled however. It is expected that a very large increase in consumption of cyanide will be recorded in 1915.

### MOND NICKEL.

In announcing an issue of £500,000 six per cent. debentures, at 99, in London this week the Mond Nickel Company achieved the distinction of putting out the first Canadian capital issue in London since the outbreak of war. There was a full four months' cessation of all Canadian capital issues, in the London market.

This newly issued stock ranks after the £3,750,000 five per cent. first mortgage debenture stock, subject to which it is a floating charge upon the undertaking and assets of the company.

The outstanding feature of the new issue as affecting the Dominion is the further announcement that the proceeds will go to further extensions to plant in Canada.

The Mond Nickel Company, which was organized in 1901, to acquire the process for the extraction of nickel invented by Dr. Ludwig Mond, as well as the latter's nickel and copper mines in Ontario and refining plant at Swansea, Wales, has made dramatic progress in its comparatively short career.

The net profit of the company grew from £2,095 in 1902, to £297,614 in the year ended April 30, 1914. The dividend of the ordinary shares, which was started at 6 per cent. in 1905, advanced by steady stages to  $21\frac{1}{4}$  per cent. in 1912-13, and to 35 per cent. in 1913-14. On the deferred capital of £50,000 the company paid dividends ranging from 18 per cent. in 1906, to 85 per cent. in 1912-13.

This spring the company announced a re-organization plan by which its ordinary shareholders received 1 preference share and  $1\frac{1}{2}$  new ordinary shares for every ordinary share previously held. The distribution, it was explained, was with a view to bringing the capitalization of the company into closer relation with the real value of the assets which had proved much greater than at first estimated.—Financial Times.

### MR. SCHWAB'S VISIT TO MONTREAL.

Montreal, Dec. 7.—The possibility of the construction by Charles M. Schwab, of the Bethlehem Steel Corporation, of destroyers and submarines in Montreal, secured strong support to-day, when it became known that during his visit to this city he inspected the shipbuilding and repairing plant of the Vickers-Maxim Company of Canada.

It is known that Mr. Schwab discussed the valuation of the plant and the work which it had on hand which might interfere with its carrying out a portion of a contract for the construction of destroyers and submarines.

No confirmation of the report that war craft will be built here was obtainable to-day from the Vickers-Maxim Company, though in the light of the fact that a meeting of its directors is being held this afternoon it is expected to have some bearing upon the matter.

Mr. Schwab was accompanied by engineers from the Fall River Shipbuilding Co.

Bethlehem Steel has been acting under advice of the most eminent international lawyers, and has held that it would be within the law to ship submarines in parts to belligerent countries. One manufacturer said the decision not to build submarines was not through fear that the law was being violated.

Prof. A. A. Michelson, winner in 1912 of Nobel prize for physical research, exhibited before National Academy of Sciences in Chicago, a bar of new steel which he claims has tensile strength many times greater than that of present product. Fortifications built of that metal, he said, might be made indestructible, thus achieving a long step toward elimination of warfare.



### CALIFORNIA GOLD.

The mine production of gold in California in 1913 was \$20,406,958, against \$19,713,478 in 1912. The output from placers and gold-quartz, copper, and lead ores increased in 1913, but there was no recovery reported from zinc ores.

The deep mines of California yielded \$11,570,781 in gold in 1913 of which \$11,222,566 was derived from gold quartz ores (almost wholly gold milling), \$320,939 from copper ores, and \$27,276 from lead ores. The gold-quartz ores produced \$10,771,759 in 1912. The placers supplied \$8,836,177 in 1913, of which \$8,090,294 was produced by dredging (against \$7,429,955 in 1912), \$329,300 came from hydraulic mines, \$224,045 from surface or sluicing operations, and \$192,538 from drift mines, in ancient river channels.

The dredges produced nearly 40 per cent. of the total gold yield in 1913 and over 91 per cent. of the placer output. The total dredge production of gold in California from 1899 to the end of 1913 has been \$63,505,485, and during these 15 years the production has steadily increased, showing small decreases only in 1900, 1907, and 1912.

### CHANGES AT QUEEN'S.

At a recent meeting of the Board of Governors of the School of Mining Profs. Malcolm and Ellis were given leave of absence from January 2nd in order to proceed overseas with the 5th Engineering Corps, and Prof. Malcolm was given the standing of Professor of Municipal Engineering. The resignation of J. E. Hyde, assistant professor of geology, who is going to the Western University, was accepted, the resignation to take effect the beginning of next session.

The board appointed Prof. A. E. Stone, Vancouver, B.C., as acting professor of municipal and structural engineering for the session, to take Prof. Malcolm's place, and J. B. Harvey, late assistant professor of surveying of McGill University, as acting professor of general engineering and surveying, to take Prof. Ellis' place. The board discussed ways and means of broadening the research work carried on by the school, and appointed committees to deal with different aspects of possible researches.

### TRAIL SMELTER ORE.

Consolidated Mining and Smelting ore receipts at Trail smelter for week ending Dec. 3rd, 1914, and from Oct. 1st, 1914, to date, in tons:

Company's mines—		
Centre Star .....	2,636	30 884
Le Roi .....	2,182	23,060
Sullivan. ....	1,011	8,240
Other mines .....	1,248	9,576
Total. ....	7,077	71,760

### HUDSON BAY RAILWAY.

From Le-Pas to Thicket Portage, a distance of 185 miles, the new line has been practically completed. It will be remembered that a year ago this portion of the line, known as section 1, was graded for a distance of 130 miles, and had received steel for 60 miles. Section 2, extending from Thicket Portage to Split Lake, a distance of 68 miles, has been graded and steel is now being laid. On section 3, the remaining 165 miles between Split lake and Port Nelson, considerable clear-

ing and grading has been done. Officials of the Department of Railways and Canals, Ottawa, state that the work will be continued throughout the winter, and that completion of the Hudson Bay Railway may be looked for early in 1916.

### THE MINING CORPORATION OF CANADA.

The Mining Corporation of Canada is making large shipments from its mines at Cobalt.

This company was incorporated March 20, 1914, with a capitalization of \$2,075,000 in shares of \$1 each. A dividend of 12½ per cent. was declared on Nov. 1 and paid on Nov. 16, 1914.

The directors are: Sir H. M. Pellatt, president; J. P. Watson, first vice-president; W. R. P. Parker, second vice-president; R. E. G. van Cutsen, George M. Clark, Graeme Watson and D'Arcy Weatherbe.

The mining properties of the Cobalt Townsite, Cobalt Lake, City of Cobalt and the Cobalt property of Townsite Extension were taken over by the corporation in April, 1914, and these companies have been wound up.

The office of the corporation is Traders Bank Bldg., Toronto. W. W. Perry is secretary.

The Steel Corporation is operating over 35 per cent. of ignot capacity, the best reported in several weeks. Orders appear more numerous, and it would not be surprising if operations were around 65 per cent. before the close of January, with prices \$1 or \$2 a ton higher.

Bethlehem Steel Co. ordnance plant is said to have all the business it can handle without construction of submarines, although the shipbuilding plants may be affected by decision not to build submarines for any belligerent nation. Whether some of this work will be carried on in Canada remains to be seen.

Two news despatches published in the Daily News, of Nelson, British Columbia, indicate an improvement in the mining situation in that province. One, from Fernie in Southeast Kootenay, dated Nov. 29th, was as follows: "The superintendent of the Kalispell (Montana) division of the Great Northern railway has been in Fernie since the 24th inst., conferring with, among others, the officials of the Crow's Nest Pass Coal Co., and it is stated that within the next week or ten days the coal order of the Great Northern railway, which has been slowly increasing for some time, will be placed on its old status, when it will be necessary for the coal mines to be worked full time. For some considerable time the miners have been working but a few shifts a week and full time will mean that the large number of unemployed miners will be given work." The other, from Grand Forks in Boundary district, also dated Nov. 29th, ran: "The Granby Co. yesterday afternoon gave notice that as soon as possible work would be resumed at the company's smelter here, by blowing in two blast furnaces, to be followed by two more as soon as conditions shall permit. Wages will be 25 per cent. less than prevailed at the time of the shut down in August." As the Granby Co.'s coke supply is obtained from the Crow's Nest Pass Coal Co. this will also favorably affect that company's coal mines.



**SPELTER.**

Boston, Dec. 10.

Spelter has advanced to 5.55 cents under continued heavy buying from abroad. With stock in producers' hands apparently reduced to a low point and with the Butte and Superior production out from the market the rise from below five cents a pound has been a logical result.

The former big buying movement during August and September, which carried spelter to above six cents, was the result of record-breaking exports during the latter month, the total being 38,090,144 lb.

Clearances during the first two weeks of November from the port of New York totaled slightly in excess of 6,000,000 lb.

With the cessation of shipment of zinc ores from Australia for treatment in Germany and Belgium Europe has been more and more dependent upon the United States for its spelter supply since the first of August.

**WELLAND CANAL CONSTRUCTION.**

Expenditures totaling about \$6,000,000 have been made on the Welland canal work this season. The contracts for sections 1, 2, 3 and 5 are reported about one-quarter completed. Together they total over \$20,000,000. The sections still to be contracted for will not be let until the existing contracts have advanced considerably further. Nearly 3,000 men are at work.

**MICHIGAN SILVER.**

The Michigan copper mines produced 295,173 fine ounces of silver in 1913, against 528,453 ounces in 1912, the decreased output being a reflection of the labor troubles of 1913, which caused a falling off in copper mining. The silver production is mainly from the electrolytic refining of the copper produced. The average recovery of silver per ton of ore treated in 1913 (both conglomerate and amygdaloid) was 0.04 ounce, against 0.05 ounce in 1912 and 0.04 ounce in 1911. Of the total production in 1913 Houghton County produced 253,030 ounces and Keweenaw County 42,143 ounces.

**CALUMET AND HECLA.**

For the second successive quarter Calumet and Hecla has passed its dividend. The passing of two disbursements in consecutive quarters has not happened heretofore since the mine went on a dividend basis 43 years ago.

The following statement is issued by the directors:

"Since the first of September the mine has been operated on three-quarters time, with a reduction of 10 per cent. in wages of the men and 15 per cent. in the pay of all salaried employees and officials.

"In the last few weeks the demand for copper has increased; but general conditions which affect the copper market are still so unsettled as not to warrant putting the men back on full time, nor the declaration of a dividend at the present time."

Mr. Wakely A. Williams, superintendent of smelters for the Granby Consolidated Co., has returned to Grand Forks, Boundary district, B.C., after having been closely employed the greater part of the year in constructing and equipping the company's smelting works at Anyox, Observatory inlet, and in getting the reduction plant in running order after its completion.

The Western Federation of Miners has called off the coal strike in Colorado.

The highest tariff in a decade has been put into effect on shipments of Michigan copper to eastern market points with the naming of 42½ cents per 100 pounds to New York and 44½ cents to Connecticut valley points. This represents an advance of seven cents per hundred-weight over the all-rail rate prevailing last winter and for the past nine or ten years following the closing of navigation. Lake producers believe that the next summer tariff will also be somewhat advanced from the 18½-cent schedule prevailing during the past few years.

Nipissing Mining Co., operating the Nipissing silver property at Cobalt, will have increased its surplus this year by between \$300,000 and \$400,000, according to present indications. This is after the payment of 20 per cent. dividends. Directors meet this month and will declare regular quarterly dividend of 5 per cent., it being the intention to continue to omit "extras" for the present.

Mr. Dudley Michel, instructor in First Aid to the Injured for the British Columbia Department of Mines, who has been occupied since last May in connection with the organization of first aid classes among metal miners in Kootenay and Boundary districts, and in giving instruction in the use of the Draeger pulmotor, was married on November 11th at Pilot Mound, Manitoba, to Miss Christina Marjory Little, daughter of Dr. Michael Little, of that place.

Henry Milton Grills is suing A. G. Penman in the non-jury Assize Court before Chief Justice Sir Glenholme Falconbridge, alleging that \$15,000 is due him from the sale of a mining claim west of Silver Lake in the Temagami Forest Reserve to Warren, Gzowski and Co. Plaintiff and defendant are real estate agents, and the former states that he and the defendant were engaged, while partners, by Warren, Gzowski & Co., to procure the right of sale of the mining claim in question. According to his view of the matter Mr. Penman entered into negotiations with Warren, Gzowski & Co., whereby he and Mr. Grills were to receive one-third interest in the mine. In 1909, he adds, Mr. Penman, without letting him know anything about it, had the one-third interest changed to a cash payment of \$30,000. Mr. Grills asserts that he only recently learned of this part of the transaction. Therefore he asks for an accounting and the sum of \$15,000. Mr. Penman denies that a partnership ever existed between the plaintiff and himself.

Gen. Villa has ordered bullion of American Smelting & Refining Co. returned to company "upon its settling with Gen. Garcia for expenses incurred."

Swedish state railways have asked American coal producers for offers for 130,000 tons of coal to be delivered next year.

The employees of Siemens Brothers' dynamo works have responded with great enthusiasm to the call to arms. A large number of men from their works and offices at Stafford, amounting in all to about 400, have already joined the forces, and, together with the reservists and volunteers from their head office, branch offices and other departments, the total amounts to over 520. The firm is arranging to keep the posts of all these men open, and ample provision is being made for all the dependents of those who have gone to serve.



### WORKMEN'S COMPENSATION COMMITTEE.

The Ontario Government has announced that Mr. A. W. Wright and Mr. Geo. A. Kingston will serve with Chairman Samuel Price, K.C., of St. Thomas. Alexander Whyte Wright has been chosen as the second member and vice-chairman of the commission. Born at Elmira, Ont., about 70 years ago, his life has been largely spent in Canada. In 1895 he was appointed by the Dominion Government a commissioner to enquire into sweatshop conditions. In 1897 he went to New York to edit the American Artisan, having acquired considerable journalistic experience in his younger days as editor of the Guelph Herald, the Orangeville Sun, the Stratford Herald and Toronto National and Labor Reformer. On his return, some years later, he became Conservative organizer for Ontario. His present home is in Niagara, although he lived for many years in Toronto.

Samuel Price, K.C., whose appointment as chairman of the Commission was announced previously, is eminent among the lawyers of the province. He lives in St. Thomas, and specializes in actuarial work and the more abstruse branches of his profession. He has served on royal commissions, and once declined the chairmanship of the Ontario Railway Board.

The third member of the commission, George A. Kingston, is 45 years of age, and has lived in Toronto continuously since 1889. He was born near Stirling, in Hastings County. During the seven years which followed his graduation from Osgoode Hall in 1892, he practised law.

Chairman Price will receive \$10,000 annually as his salary; Mr. Wright, \$8,500, and Mr. Kingston, \$7,500.

It has been announced that the new Workmen's Compensation Act of Ontario will go into effect on January 1, 1915.

### METAL OUTPUT OF ONTARIO.

Following is a summary of shipments of metalliferous ore from Ontario mines for the nine months ending September 30, 1914:

	Amount.	Value.
Gold, oz. . . . .	196,934	\$3,942,848
Silver, oz. . . . .	19,448,018	10,082,229
Copper, tons . . . . .	11,585	1,664,896
Nickel, tons . . . . .	18,085	4,023,556
Iron ore, tons . . . . .	165,759	379,918
Pig iron, tons . . . . .	495,161	6,444,213
Cobalt ore, tons . . . . .	95	26,563
Cobalt and Nickel oxides, lbs. . . . .	852,014	454,687

### GERMAN OIL SUPPLY.

There is no doubt that Germany is badly supplied with petroleum products, whether motor spirit, kerosene, or fuel oil, and that as the war progresses the scarcity of these is felt to an increasing degree.

Germany's direct oversea imports are stopped by the action of the British fleet; but there are certain channels through which petroleum supplies have reached Germany indirectly. Holland was one of these channels; but there is every reason to believe that, owing to the prompt measures taken by the Netherlands Government to secure the maintenance of strict neutrality, this route has been largely blocked.

There are in addition Denmark and the Scandinavian countries. One of the active spots in a very apathetic

oil export market in New York has been the persistent enquiry for refined oil in barrels for these parts, and the unusual chartering of Norwegian and Danish steamers to carry these cargoes. Scores of thousands of barrels a week have been thus arranged for; and there has been no secret about where the oil was going; in fact, the correspondent of one well-known American paper openly stated that it was for Germany.

Fortunately the British authorities at home are aware of this important movement; and we may have every confidence that prompt and vigorous steps will be taken to counteract it.

Germany's only remaining source of overland supplies, now that Russia and Austria are no longer available, is Roumania; and during the last few days news has reached London that considerable quantities of motor spirits were being imported thence via Hungary. Of course no British-owned oil company is engaged in this traffic; but one must remember that the largest petroleum corporation in Roumania, the Steaua Romana, is under German control. It is believed to be this concern which is making the deliveries.—Oil News.

Readers of this journal who are familiar with mine-rescue work will probably be interested in the following extract from the columns of "Mining and Scientific Press," San Francisco: "At the Labor Day first-aid and mine-rescue celebration at the University of Nevada in September, one of the interesting events was the demonstration made by E. P. Cullinan, chief electrician of the Tonopah Belmont Co., of his method by which one man can carry two unconscious men from a mine, although the burden may be more than twice the weight of the rescuer. To illustrate his method, Mr. Cullinan, who weighs 140 lbs., placed two men on the ground, the first on his stomach and the other in the same position on top of him, with arms extended forward over and beyond the shoulders of the first man. Taking a position at the head of the two men, Mr. Cullinan raised their heads and bodies to an angle of about 45 deg., then loosening his hold he ducked under them as their bodies fell, and caught them on his back. Then securing a lock hold at the knee and arms, he rose with the two men on his back, and in that position was able to carry them a considerable distance. The combined weight of the two men whom Mr. Cullinan carried was 335 lbs. The method has been named the 'Nevada one-man carry,' and it is a distinct innovation in the mine-rescue work."

### KEWAGAMA.

The Department of Mines, Ottawa, has issued a geological map of the Kewagama district, Quebec, north east of Lake Timiskaming. The northern part of the area mapped is traversed by the National Transcontinental Railway. Opasatika lake, where gold discoveries have been made is in the area mapped.

The U. S. steel industry, with its allied branches, which employs close to 1,000,000 men, was operating around 70 per cent. before the war. Some independent companies were averaging considerably above 70 per cent. Two or three weeks ago the steel industry was down to 30 per cent., and operations now cannot be greatly in excess of 35 per cent. Equipment companies have been on a 25 per cent. basis for a long time.

## MARKETS

## STANDARD MINING EXCHANGE.

Dec. 11, 1914.

Following are the quotations on the Standard Exchange:

Cobalt stocks—	Sellers.	Buyers.
Bailey. . . . .	.01¾	.01½
Beaver Consolidated . . . . .	.20	.19
Buffalo. . . . .	1.10	.90
Chambers-Ferland. . . . .	.15	.13
Coniagas. . . . .	5.85	5.50
Crown Reserve . . . . .	.80	.75
Gould. . . . .	.01	.01½
Great Northern . . . . .	.05½	.05
Hudson Bay . . . . .	50.00	...
Kerr Lake . . . . .	5.00	4.50
La Rose . . . . .	.77	.68
McKinley-Darragh-Savage. . . . .	.60	.54
Nipissing. . . . .	5.75	5.55
Peterson Lake . . . . .	.28	.27
Right of Way . . . . .	...	.02
Seneca Superior . . . . .	2.10	...
Silver Leaf . . . . .	.03¼	.03
Timiskaming. . . . .	.11¼	.10½
Trethewey. . . . .	...	.15
Wettlaufer. . . . .	.10	.05
York, Ont. . . . .	...	.05

## Porcupine Stocks—

Apex. . . . .	.02¼	.02
Dome Extension. . . . .	.09	.08¾
Dome Lake . . . . .	.35	.33
Dome Mines . . . . .	8.50	8.00
Foley O'Brien . . . . .	.20	.17½
Gold Reef . . . . .	...	.01½
Homestake. . . . .	...	.12
Hollinger. . . . .	19.30	19.10
Jupiter. . . . .	.09¾	.09¼
McIntyre. . . . .	.25	.24
Pearl Lake . . . . .	.03½	.03¼
Porcupine Crown . . . . .	.85	.70
Porcupine Gold . . . . .	.01	.00½
Porcupine Imperial . . . . .	.01½	.01
Porcupine Tisdale . . . . .	...	.00¼
Porcupine Vipond . . . . .	.25	.23½
Teek-Hughes . . . . .	.09½	.09
United Porcupine . . . . .	...	.00¾

## SILVER PRICES.

New York. London.

November—	cents.	pence.
24. . . . .	49¾	22½
25. . . . .	49¾	23
26. . . . .	...	22¾
27. . . . .	49¼	22½
28. . . . .	49¼	22¾
30. . . . .	49½	22¾
December—		
1. . . . .	49¾	23
2. . . . .	49¾	23½
3. . . . .	49¾	23½
4. . . . .	49¾	23
5. . . . .	49¾	23½
7. . . . .	50¼	23¼
8. . . . .	50¼	23¼
9. . . . .	49¾	23½
10. . . . .	49¾	23½
11. . . . .	50	23½

## TORONTO MARKETS.

Dec. 12—(Quotations from Canada Metal Co., Toronto)—

Spelter, 6 cents per lb.  
 Lead, 5 cents per lb.  
 Tin, 35 cents per lb.  
 Antimony, 17 cents per lb.  
 Copper casting, 13½ cents per lb.  
 Electrolytic, 13½ cents per lb.  
 Ingot brass, yellow, 10c. per lb., red, 12c. per lb.

Dec. 11—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, \$8.00 per ton.  
 Coal, bituminous, \$5.25 per ton.

## GENERAL MARKETS.

Dec. 10—(Connellsville coke (f.o.b. ovens)—

Furnace coke, \$1.65 to \$1.75 per ton.  
 Foundry coke, prompt, \$2.10 to \$2.50 per ton.

Dec. 10—Tin, straits, 32.75 cents.

Copper, Prime Lake, 12.87½ to 13.00 cents.  
 Electrolytic copper, 12.75 to 12.85 cents.  
 Copper wire, 14.25 cents.  
 Lead, 3.80 cents.  
 Spelter, 5.70 to 5.80 cents.  
 Sheet zinc (f.o.b. smelter), 8.50 cents.  
 Antimony, Cookson's, 15.75 to 16.25 cents.  
 Aluminum, 18.75 to 19.25 cents.  
 Nickel, 40.00 to 45.00 cents.  
 Platinum, soft, \$44.00 to \$46.00 per ounce.  
 Platinum, hard, 10 p.e., \$48.00 to \$50.00 per ounce.  
 Bismuth, \$2.75 to \$3.00 per pound.  
 Quicksilver, \$52.50 per 75 lb. flask.

## PETERSON LAKE.

It is understood that the origin of the recent rise in Peterson Lake stock is due to the cutting of a promising looking vein on the property at the 300-ft. level in a cross-cut. This vein is in the Keewatin, but is being followed into the conglomerate, where it is hoped that it will develop into ore. It is at present calcite, with small silver values.

## ROUMANIAN OIL.

The Roumanian Government has forbidden the export of oil and oil products and the oil business there is almost at a standstill. It is reported the new work is going on, but that as there is a large supply on hand pumping has been stopped at most of the wells.

## HOLLINGER HAS SUPPLIES.

In view of the threatened shortage of supplies for the treatment of gold ores the following statement by Mr. P. A. Robbins, of the Hollinger, is of interest. He says: "We have been successful in fortifying ourselves against shortage in chemicals and other foreign-made supplies. Good stocks of all necessities are on hand and we anticipate no trouble in keeping our stock up."

## GERMAN HEROES.

—I have bestowed on Gen. von Havoc the Iron Cross for his noble work at Rheims. God is with us, and I still hope to blow up the Cathedral of Notre Dame at Paris.

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We continue to fight in defence of the Fatherland.

WILLIAM.

—Life.



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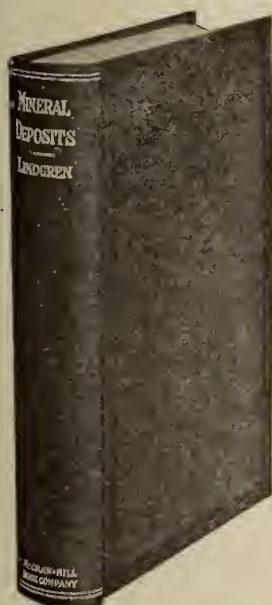
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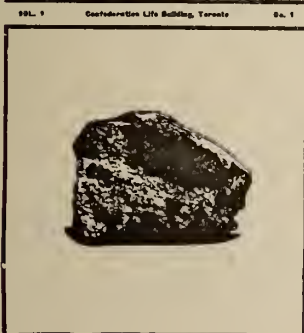
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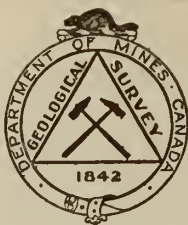
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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

#### CANADA

Prospector's Handbook No. 1. Notes on radium-bearing minerals, by Wyatt Malcolm.  
Summary Report of the Geological Survey for the year 1912.

#### NEW BRUNSWICK and NOVA SCOTIA

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

#### QUEBEC

Memoir 41. The "Fern Ledges" Carboniferous flora of St. John, New Brunswick, by Marie C. Stopes.

Museum Bulletin No. 3. The Anticosti Island faunas, by W. H. Twenhofel.

Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.

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Museum Bulletin No. 5. A Beatrice-like Organism from the Middle Devonian, by Percy E. Raymond.

Memoir 40. The Archaean Geology of Rainy Lake Re-studied, by Andrew C. Lawson.

#### NORTH-WEST PROVINCES

Memoir 47. Clay and Shale Deposits of the Western Provinces, Part 3, by Heinrich Ries.

Memoir 52. Geological Notes to Accompany Map of Sheep River Gas and Oil Field, Alberta, by D. B. Dowling.

Memoir 53. Coal Fields of Manitoba, Saskatchewan, Alberta and Eastern British Columbia (Revised Edition) by D. B. Dowling.

Museum Bulletin No. 4. The Crowsnest Volcanics, by J. D. MacKenzie.

Memoir 61. Moose Mountain District, Southern Alberta (Second Edition), by D. D. Cairnes.

#### BRITISH COLUMBIA

Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.

Memoir 51. Geology of the Nanaimo Map-Area, by C. H. Clapp.

#### YUKON AND NORTH-WEST TERRITORIES

Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes. Maps not yet published.

### MAPS RECENTLY ISSUED:

#### CANADA

Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

#### NEW BRUNSWICK AND NOVA SCOTIA

Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.

Map 39A. Geological Map of Nova Scotia.

Map 118A. Pleasant River Barrens Gold District, Lunenburg County, Nova Scotia.

Map 121A. Franey Mine and Vicinity, Victoria County, N.S.

#### QUEBEC

Map 93A. Kewagama, Abitibi and Pontiac, Quebec.

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Map 100A. Bell River, Quebec. Geology.

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Map 49A. Orillia sheet, Simcoe and Ontario counties, Ontario. Topography.

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Map 43A. Sooke Sheet, Vancouver Island, British Columbia. Topography.

Map 136A. Hazelton-Aldermere, Cassiar and Coast Districts, British Columbia.

1321. Diagram Showing the Geology of Texada Island, British Columbia.

Map 106A. Groundhog coal field, British Columbia. Geology.

#### YUKON AND NORTH-WEST TERRITORIES

Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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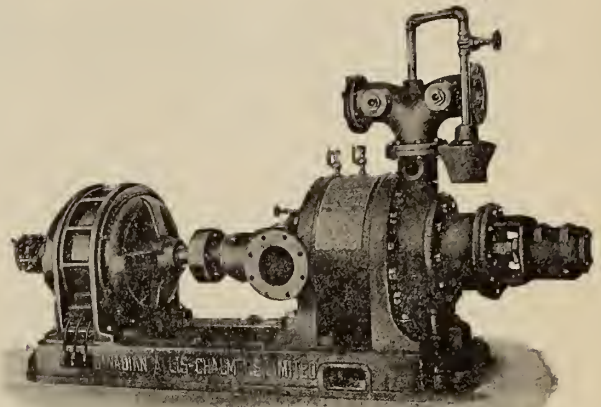


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The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Peacock Bros.  
Lymans, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Haddfields Steel Foundry Co.
- Cyanide Plants—**  
Jenckes Machine Co., Ltd.  
Fraser & Chalmers of Canada, Limited  
Roessler & Hasslacher  
Thos. & Wm. Smith  
Peacock Bros.
- Derricks—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.
- Diamonds (for Diamond Drills)—**  
Abe. Levine
- Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith & Travers.
- Dredging Machinery—**  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.
- Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers of Canada, Limited  
B. Greening Wire Co., Ltd.
- Drills, Air and Hammer—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.
- Drills—Core—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.
- Drills—Diamond—**  
American Diamond Rock Drills  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drill Steel Sharpeners—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Mussens, Ltd.
- Drills—Electric—**  
Canadian Allis-Chalmers, Ltd.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.
- Dump Cars—**  
Sullivan Machinery Co.  
Mussens, Ltd.  
Mussens, Ltd.  
Siemens Co. of Canada, Ltd.
- Conveyors—Belt—**  
Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.
- Dynamite—**  
Curtis & Harvey (Canada), Ltd.
- Canadian Explosives**  
Northern Canada Supply Co.
- Dynamos—**  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.
- Electric Cranes—**  
The Herbert Morris Crane & Hoist Co., Ltd.  
Mussens, Ltd.
- Elevating and Conveying Machinery—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Ejectors—**  
Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Elevators—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Peacock Bros.
- Engineering Instruments—**  
C. L. Berger & Sons  
Peacock Bros.
- Engineers and Contractors—**  
Fraser & Chalmers of Canada, Limited  
Roberts & Schaefer Co.
- Engines—Automatic—**  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.
- Engines—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Mussens, Ltd.  
Alex. Fleck  
Sullivan Machinery Co.  
Smart-Turner Machine Co.  
Peacock Bros.  
John Inglis & Co., Ltd.  
Can. Fairbanks-Morse Co.
- Engine—Haulage—**  
Mussens, Ltd.  
Rock & Power Mach'y, Ltd.  
Fraser & Chalmers of Canada, Limited  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.
- Engines—Marine—**  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.
- Engines—Oil—**  
Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.
- Engines—Steam—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
The John Inglis Co., Ltd.
- Fans—Ventilating—**  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.
- Feeders—Ore—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Fraser & Chalmers of Canada, Limited  
Mussens, Ltd.
- Flights—**  
Hendrick Mfg. Co.
- Friction Hoists—**  
Rock & Power Mach'y, Ltd.  
The Herbert Morris Crane & Hoist Co., Ltd.
- Forges—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co., Ltd.
- Forging—**  
M. Beatty & Sons  
Smart-Turner Machine Co.  
Peacock Bros.



# Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.  
Main Western Office - VICTORIA, B.C.

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means quality

Get this stamp on your explosives and you get efficiency.

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We specialize in explosives for safe coal getting and rock work.

We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

We also handle the best of blasting accessories, including Electric Fuses, Electric Time Fuses, Safety Fuse, Blasting Batteries, Tamping Bags, Thawing Cans, Connecting Wire and Leading Wire, in fact everything needed for your work.

Our Stumping Powder has made land clearing cheap and easy for the farmer.

We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

## DISTRICT OFFICES:

NOVA SCOTIA:	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,		Kingston
MANITOBA:	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,			Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

## Canadian Miner's Buying Directory.—(Continued from page 28.)

- Furnaces—Assay—**  
Lymans, Ltd.  
Mussens, Ltd.
- Fuse—**  
Peacock Bros.  
Curtis & Harvey, (Canada),  
Limited  
Canadian Explosives  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian H. W. Johns-Man-  
ville Co., Ltd.
- Gears—**  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
The John Inglis Co., Ltd.
- Generators—**  
Northern Electric Co., Ltd.  
Peacock Bros.  
Can. Fairbanks-Morse Co.
- Hangers—Cable—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co. of Canada, Ltd.
- Hand Hoists—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.  
Fraser & Chalmers of Can-  
ada, Limited
- Heaters—Feed Water—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.
- High Speed Steel Twist Drills—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Hoists—Air Electric and  
Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco  
M. Beatty & Sons  
Can. Fairbanks-Morse Co.  
Fraser & Chalmers of Can-  
ada, Limited  
Northern Canada Supply Co.
- Hoists, Chain, Electric and  
Pneumatic—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Hoisting and Conveying Mach-  
inery—**  
Rock & Power Mach'y, Ltd.  
Jenckes Machine Co., Ltd.
- Hoisting Engines—**  
Rock & Power Mach'y, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Peacock Bros.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Sullivan Machinery Co.  
Fraser & Chalmers of Can-  
ada, Limited  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons
- Hoists—Gas and Gasoline—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.
- Hose—**  
Canadian H. W. Johns-Man-  
ville Co., Ltd.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Jacks—**  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Jigs—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Allis-Chalmers, Ltd.  
Roberts & Schaefer Co.
- Lamps—Acetylene—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Lamps—Safety—**  
Mussens, Ltd.  
Canadian Explosives  
Peacock Bros.
- Link Belt—**  
Northern Canada Supply Co.  
Jones & Glassco
- Locomotives—Electric—**  
Mussens, Ltd.  
Jeffrey Mfg. Co.
- Locomotives—Steam—**  
Mussens, Ltd.
- Metal Merchants—**  
Henry Bath & Son  
Geo. G. Blackwell Sons &  
Co.  
Consolidated Mining and  
Smelting Co. of Canada  
Canada Metal Co.
- Monel Metal—**  
Orford Copper Co.
- Motors—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.
- Ore Sacks—**  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Ore Testing Works—**  
Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co., Ltd.  
Campbell & Deyell
- Ores and Metals—Buyers and  
Sellers of—**  
Geo. G. Blackwell.  
Consolidated Mining and  
Smelting Co. of Canada  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pick Machines—**  
Sullivan Machinery Co.
- Picks—Steel—**  
Mussens, Ltd.  
Thos. & Wm. Smith  
Peacock Bros.
- Pipes—**  
Consolidated M. & S. Co.  
Peacock Bros.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.  
A. M. Byers Co.
- Pipe Fittings—**  
Can. H. W. Johns-Manville  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Northern Canada Supply Co.
- Pneumatic Chain Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco
- Producer—Gas—**  
Mussens, Ltd.
- Prospecting Mills and Machin-  
ery—**  
Rock & Power Mach'y, Ltd.  
Standard Diamond Drill Co.  
Mussens, Ltd.  
Can. Fairbanks-Morse Co.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited
- Pulleys, Shaftings and Hang-  
ings—**  
Fraser & Chalmers of Can-  
ada, Limited  
Northern Canada Supply Co.
- Pumps—Boiler Feed—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.  
Fraser & Chalmers of Can-  
ada, Limited
- Pumps—Centrifugal—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Thos. & Wm. Smith  
M. Beatty & Sons  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
The John Inglis Co., Ltd.
- Pumps—Electric—**  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.
- Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
The John Inglis Co., Ltd.
- Pumps—Pneumatic—**  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Fairbanks-Morse Co.  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.
- Pumps—Steam—**  
Rock & Power Mach'y, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Northern Canada Supply Co.  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.  
The John Inglis Co., Ltd.
- Pumps—Turbine—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co.,  
Ltd.
- Pumps—Vacuum—**  
Can. Fairbanks-Morse Co.  
Smart-Turner Machine Co.
- Quarrying Machinery—**  
Mussens, Ltd.  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Can. Cleveland Drill Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Roasting Plants—**  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited
- Rolls—Crushing—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited  
Can. Allis-Chalmers, Ltd.
- Roofing—**  
Paterson Mfg. Co.  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville
- Rope Blocks—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.  
Mussens, Ltd.
- Rope—Manilla and Jute—**  
Jones & Glassco  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.
- Rope—Wire—**  
B. Greening Wire Co.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith  
Fraser & Chalmers of Can-  
ada, Limited  
Mussens, Ltd.
- Rubber—**  
Canadian Consolidated Rub-  
ber Co., Ltd.
- Runways, Hand Operated—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Samplers—**  
Canadian Laboratories  
Ledoux & Co.  
Milton Hersey Co.  
Thos. Heys & Son
- Screens—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
R. Greening Wire Co.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited  
Jenckes Machine Co., Ltd.
- Screens—Cross Patent Flang-  
ed Lip—**  
Hendrick Mfg. Co.
- Separators—**  
Rock & Power Mach'y, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
The John Inglis Co., Ltd.
- Sheets—Genuine Manganese  
Bronze—**  
Hendrick Mfg. Co.
- Shear Legs—**  
The Herbert Morris Crane &  
Hoist Co., Ltd.
- Shovels—Steam—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
M. Beatty & Sons
- Slime Tables—**  
James Ore Concentrator  
Can. Allis-Chalmers, Ltd.
- Smelting Machinery—**  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited
- Stacks—Smoke Stacks—**  
Canadian H. W. Johns-Man-  
ville Co., Ltd.  
Hendrick Mfg. Co.
- Stamp Mills—**  
Jenckes Machine Co., Ltd.  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Can. Fairbanks-Morse Co.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited
- Steel Drills—**  
Rock & Power Mach'y, Ltd.  
Sullivan Machinery Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Swedish Steel & Imp. Co., Ltd.
- Steel—Tool—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith  
Can. Fairbanks-Morse Co.  
N. S. Steel & Coal Co.  
Swedish Steel & Imp. Co., Ltd.
- Surveying Instruments—**  
Peacock Bros.  
W. F. Stanley  
C. L. Berger
- Switchboards—**  
Can. Allis-Chalmers, Ltd.  
Northern Electric Co., Ltd.
- Tanks—Cyanide, Etc.—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited  
Jenckes Machine Co., Ltd.  
Hendrick Mfg. Co.
- Tramways—**  
Mussens, Ltd.  
B. Greening Wire Co.  
Can. A's-Chalmers, Ltd.
- Transformers—**  
Can. Fairbanks-Morse Co.  
Northern Electric Co., Ltd.  
Peacock Bros.
- Transits—**  
C. L. Berger & Sons  
Peacock Bros.
- Tractors—Oil—**  
Can. Fairbanks-Morse Co.
- Tube Mills—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Can-  
ada, Limited
- Turbines—**  
Rock & Power Mach'y, Ltd.  
Peacock Bros.  
Can. Allis-Chalmers, Ltd.  
Fraser & Chalmers of Can-  
ada, Limited
- Water Wheels—**  
Can. Allis-Chalmers, Ltd.
- Winding Engines—**  
Rock & Power Mach'y, Ltd.  
Mussens, Ltd.  
Can. Allis-Chalmers, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co.,  
Ltd.
- Wire Cloth—**  
Mussens, Ltd.  
Northern Canada Supply Co.  
B. Greening Wire Co.
- Wire (Bare and Insulated)—**  
Northern Electric Co., Ltd.  
Standard Underground Cable  
Co., of Canada, Ltd.
- Zinc Dust—**  
Roessler & Hasslacher.



# BRITISH COLUMBIA

## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$72,704,603; Lode Gold, \$76,486,512; Silver \$35,832,546; Lead, \$29,696,585; Copper, \$80,818,051; Other Metals (Zinc, Iron, etc.), \$1,852,824; Coal and Coke, \$142,068,615; Building Stone, Brick, Cement, etc., \$20,974,184; making its Mineral Production to the end of 1912 show an

### Aggregate Value of \$460,433,920

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1888, inclusive, \$69,598,850; for five years, 1889-1893, \$15,079,632; for five years, 1894-1898, \$38,738,844; for five years 1889-1903, \$83,807,166; for five years, 1904-1908, \$116,153,067; for five years, 1909-1913, \$137,056,361.

### Production During last ten years, \$253,209,428

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with mining Reports and Maps, may be obtained gratis by addressing

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### DWIGHT & LLOYD SYSTEM

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SIMPLE, EFFICIENT, CONTINUOUS  
LOW COST OF INSTALLATION

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(Successor to Dwight & Lloyd Metallurgical Co.)

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American Ore Reclamation Co.

71 BROADWAY, N.Y.

## "B.C." Mining Drill Steel

### The Steel with a Reputation

Has stood the test in Canada for Twenty  
years.

Manufactured by

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SHEFFIELD, England.

Full Stocks carried by

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Cobalt: The Canadian Rand Co., Ltd.

Victoria B.C.: E. G. Prior & Co., Ltd.

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to

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Commissioner of Public Works and Mines,  
HALIFAX, N. S.

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### Opened for Prospecting

*Two thousand square miles of railway lands in the Lake Superior region that have been held in reserve during the construction of the A. C. & H. B. Railway are now open for public prospecting.*

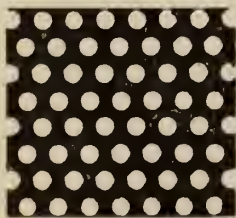
*No license is required; staking, recording and assessment work practically as on Government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. The lands are in alternate blocks with intervening areas of Government lands which are also open for prospecting. Two passenger trains daily through the district.*

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Manager, Lands Dept., A. C. & H. B. Ry.,

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*For Every and All  
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NEWCASTLE-ON-TYNE, ENGLAND.

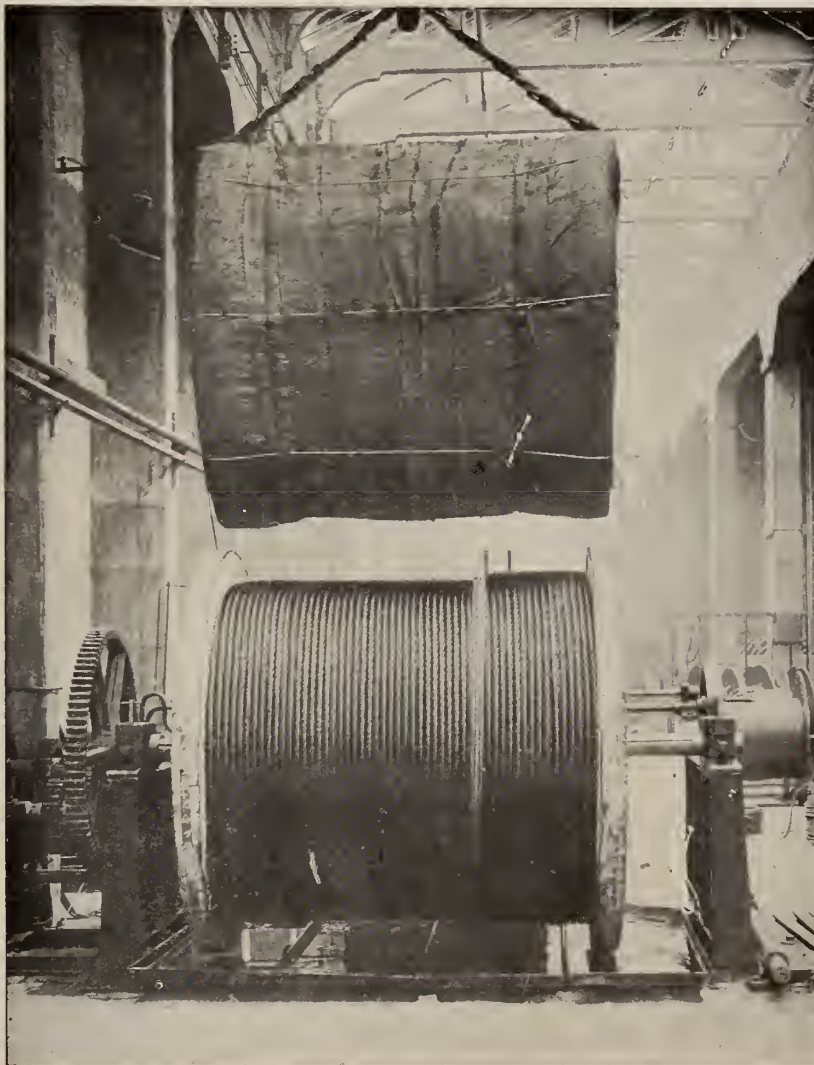
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Two Reels of Wire Rope for a Colliery Company in Nova Scotia, each 10,000 feet long,  $1\frac{1}{8}$ " diameter, and weighing ten tons each

**MODERN AND UP-TO-DATE APPLIANCES**  
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